The Iron Age

A Review of the Hardware and Metal Trades.

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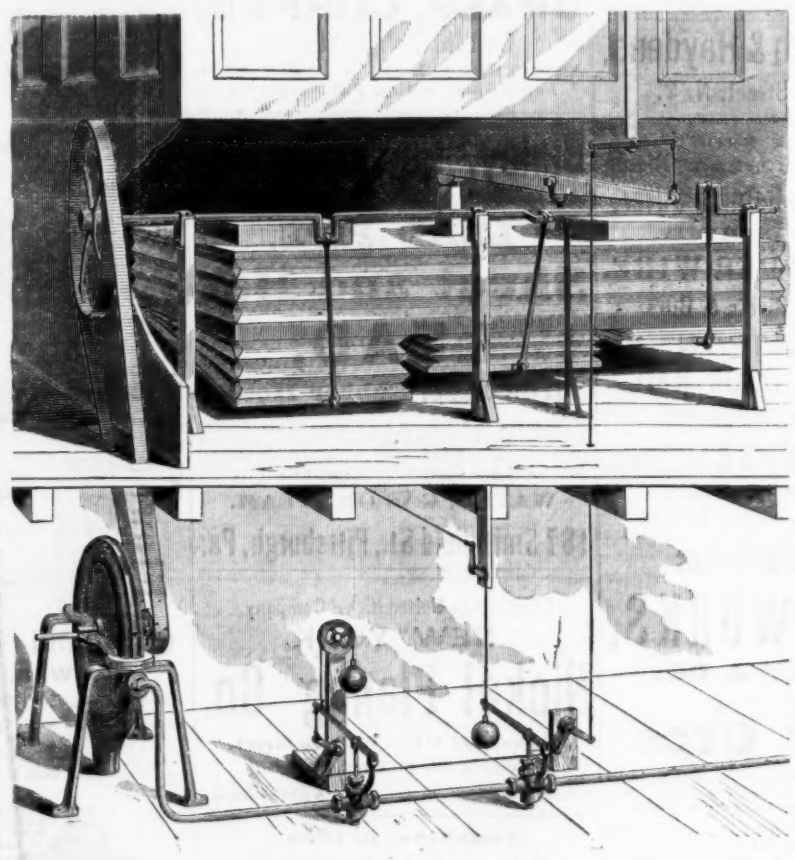
An Improved Water Motor.

We illustrate herewith an improved water motor, invented by Mr. Oscar J. Backus, of Oakland, Cal., and manufactured by Messrs. Backus Bros. & Co., Newark, N. J. It consists of a light but firmly constructed iron wheel, provided on its outer rim with buckets, and the whole enclosed in a water-tight iron casing. Through the casing an ordinary water pipe is so inserted that a stream of water from the pipe, flowing downward, strikes the buckets at a right angle with the radius of the wheel. The aperture at the end of the pipe is comparatively small, and on this account the water is forced through and against the buckets with a percussion-like effect, thus imparting a rapid and steady motion to the wheel.

In the illustration, the motor is shown attached to an organ bellows, the belt running from a small pulley on the motor to a large wheel on a crank shaft, to which the pitman from each feeder is attached. These feeders are shown at various stages, working alternately. In the supply pipe are two valves, one under the control of the organist, to admit or shut off the water, while the other is a regulator and works automatically. To start the motor, the performer has only to pull up the lever which opens the throttle valve. When the main bellows are full, the upper side, in rising, strikes a lever which is connected with the regulating valve by wire cords and bell cranks, as shown, closing said valve and shutting off the water. The inventor claims that this arrangement is extremely sensitive, a mere touch on the keys of the instrument being followed instantly by a few revolutions of the motor, for a period just sufficient to replace the air expended. From testimonials submitted to us, it appears that the employment of the invention upon organs has been successful, and that the amount of water used has been about one-third the quantity necessitated by other devices. It is stated that there is no jerking or thumping, but an even, smooth, noiseless, steady motion; while the apparatus is, beside, claimed to be simple, durable and cheap, and to run for years without repairs. It is now in use on several organs of 40 stops, doing the work with a pressure of water of 20 pounds per square inch, costing per annum, as we understand the inventor to assert, from $12 to $15.

The invention is also adapted for driving sewing machines, and, we are informed, can be applied to a single machine for domestic use so as to run at a cost of from $2·50 to $3 per annum. By regulating the water supply through a foot treadle, any speed may be attained from one stitch per second to 1000 per minute, as desired. The apparatus can be attached to the ordinary water pipes, and it is claimed that a stream no larger than the head of a pin is sufficient to drive a sewing machine. Generally, the device can be used where the pressure is from 12 pounds upward.

Among other practical applications of the motor may be mentioned its use for printing presses, turning lathes, jewelers' lathes, opticians' and lapidaries' wheels, grinding coffee and spices, cutting sausage, hoisting for stores and private residences, and, in fact, all light machinery requiring one horse-power or less.



BACKUS' IMPROVED WATER MOTOR.

American and British Manufactures.

Mr. E. H. Derby, of Boston, sends the following interesting letter to the *Tribune:*

It has been the prevalent opinion abroad that agriculture was the chief occupation of our people. The revelations of the late census show that such is not the case, and that the operatives engaged in the manufactures and the mechanical arts, in commerce, transportation, and the professions, exceed in number those who cultivate the earth. This disparity is constantly increasing, as mechanism in the shape of modern sowers, reapers, and thrashers, with steam plows, diminishes labor, and new branches of manufactures are established. By the late census the annual production of our manufactures is valued at $5,000,000,000, while that of agriculture is only half that amount. By the previous census the former was less than that of agriculture. This change is remarkable. The number of persons in this country engaged in the various pursuits of life appear in extracts from the Census Report for 1870 to be as follows: Number of operatives employed in agriculture, 5,922,471; in manufactures, 2,555,314; in the mechanical arts, in the professions, and in personal services, 2,684,793; number engaged in commerce and transportation, 1,191,238; number engaged in mining, 152,107; total number of merchanics, 6,583,452.

Another fact is disclosed by our census and by a paper presented to the Congress at St. Petersburg a few months ago by Leone Levi, one of the prominent statisticians of England. These when placed side by side show that the number of operatives employed in Great Britain and Ireland is only three-fifths the number thus employed in the United States. A few of the reports of the transactions of this Congress have recently reach this country in three large volumes of more than 1500 pages each. These volumes contain papers from the statisticians of many countries, including several from England and the United States. Among these is the paper of M. F. Levi, which gives the following statement of the division of labor among the operatives in the British Isles: number of persons employed on texile fabrics, 1,054,947; metal manufacturers, 180,660; leather, 8692; chemicals, 49,987; articles of food, 31,255; building, 20,823; paper, 37,422; miscellaneous, 211,522; total, 1,595,288. Comparing the number of American operatives, 2,555,314, with the number of British operatives, 1,595,288, I find that there are 960,026 more operatives in the United States than in Great Britain.

I have no means of comparing the value of British manufactures with the value of those produced in the United States, for I cannot find any returns. But as labor is better paid in this country than it is in Europe, and the rate of interest is higher, we may safely infer from the greater number of operatives here, and their superior education, intelligence and dispatch, easier access to better markets than English workmen, that the annual produce of our manufactures is twice as great as the annual production in the British Isles. It is probably nearly equal to that of both France and the United Kingdom.

Should this suggestion be made to an Englishman he would probably at once exclaim, "This cannot be." He would then ask, "Do you make more textile fabrics, more earthenware, or chemicals, or fabrics from metals, or steamships?" This question we should be obliged to answer in the negative. We should then, however, ask him in reply, "How do the countries compare in their production of locomotives, carriages and other vehicles, fabrics of leather, clothing, bricks, nails, and other building materials, clocks, watches, and a long list of other fabrics?" Think of the new houses and furniture required by the 1,500,000 persons yearly added to the population of the United States; of the boots, shoes, hats yearly required by this population, and also of the masses who are improving their position from year to year, and requiring yearly better houses, clothes, and furniture. Contrast their progress with the slow growth of England. Think of the cars and engines now in use on 78,000 miles of railway: there are only 15,000 miles of railroad in the British Isles. Think of the great excess in the number of horses in this country; an excess of more than three to one; and of the horseshoes, saddles, harnesses, and vehicles which they demand.

When our European cousins visit us and inspect our fabrics at the great exposition of 1876, let us show them what has been effected in a single century since Burnaby wrote home that New England could never compete with old England in cloth, then the great staple of the latter, because her sheep were inferior to those of England. That was a time when the artisans of America were forbidden to slit iron, or to export hats from province to province. Let us ask them to see what a home market has been created by the importation of the workman rather than his products. As wages advance on the other side of the Atlantic and recede on this we may reduce many of our duties; but could our country afford to part with or throw back upon agriculture the masses who now furnish a market for the farmer? Could England or France consume the grain or provisions they might produce, or supply the fabrics they furnish at present prices? In another department the United States compare more favorably with England than is generally supposed. That is in navigation. Most of the ships and steamers of England are engaged in foreign commerce. Her coastwise commerce is confined within narrow limits by the size of the British Isles; her voyages become foreign as soon as her vessels cross the narrow seas and touch France, Spain or Germany; while with us the coastwise trade extends from Maine to Texas and California. In that trade, which is exclusively our own, the business is conducted with such energy and dispatch that, while we are behind Europe in our foreign trade, the entries and clearances of tonnage in our ports exceed those in the ports of Great Britain. This is shown by the following extracts from a paper recently submitted to the Congress of Statisticians at St. Petersburg:

At this time more than three-fourths of the shipping of the United States is engaged in the coastwise trade, which is nearly three times as great as the foreign trade, and is wholly under the flag of the United States. It is gigantic in its proportions, comprising, as it does, the commerce between all the ports of the United States, from the Bay of Fundy to the Rio Grande, including also voyages of 18,000 miles in length around Cape Horn, between the seaports of our Atlantic coast and those of California, Oregon and Alaska. The entries and clearances in the ports of the United States for the year ending with January, 1872, exceed the entries and clearances for the same period in the ports of Great Britain. They have been as follows:

		Tons.
Entries and clearances in United States coastwise trade in ports of the United States for the year ending January 31, 1872		61,050,287
In foreign trade of United States in the same year		21,402,015
Total		82,452,302
Entries and clearances in the ports of Great Britain for 1871	Foreign trade.	35,496,234
	Coastwise.	36,726,300
Total		72,227,534

Our tonnage in the coastwise trade, which is sedulously guarded by the nation, is nearly three times as great as that in the foreign trade in which the foreign flag has predominated. The movement in the coastwise trade is remarkable, but there is conclusive evidence to show that the movement by our canals and railways, and chiefly by the latter, is four times as large as that in the coastwise trade. Here we find a vast commerce independent of the sea, and inaccessible to any foe, reaching from gulf to gulf and ocean to ocean, and radiating from the great centers of production to the centers of consumption. This commerce comprises not merely the products of agriculture, but the produce of the mechanical arts, which the different sections of the republic interchange with each other.

The Deepest Coal Shaft in America.

The deepest coal shaft in Great Britain is said to be the Dunkenfield, 2000 feet below ground. In America we are likely to go even deeper than the Dunkenfield. The Philadelphia and Reading Coal and Iron Company has ascertained that the depth of the Mammoth Vein of anthracite coal, near Pottsville, is 2070 feet. This vein is known to be over 50 feet thick. The shaft has already been sunk a distance of 1335 feet. A correspondent of the Philadelphia *Times* gives the following account of this shaft:

POTTSVILLE, PA., March 20, 1875.—Your readers have doubtless heard from time to time of the progress made in sinking the shaft at East Norwegian, two miles from this place, to the Mammoth Vein. The shaft has been sunk, up to six o'clock p. m. to-day, 1340 feet, a greater depth by nearly 500 feet than any shaft ever sunk in an American coal mine heretofore. It will be sunk 200 feet deeper before it reaches the Primrose Vein, and from that vein the Mammoth will be reached by tunneling. During a recent visit to the office of General Pleasants, Chief Engineer of the Philadelphia and Reading Coal and Iron Company, I received an invitation to visit the shaft, an invitation which I gladly accepted, for the reason that it is not often tendered to any one. Provided with a letter of introduction to Mr. Bramley, Superintendent, I started on a walk down the railroad track, and reached the works in about half an hour. Mr. Bramley received me very cordially, and kindly pointed out the objects of interest above ground—the immense air pumps used for pumping compressed air into the drills used for boring into the mines, the monster pump used for pumping the water from the shafts, each stroke of which brings up 160 gallons, the engine houses, blacksmith shops, etc., and then asked if I would like to descend the shaft. Well, to be frank with you, my anxiety to go down the shaft had been so great ever since I presented myself at the works that I would give but half an ear to Mr. Bramley's explanations of the different workshops about the yards, and this is why I have not trusted myself to refer to them except in general terms. As Mr. Bramley extended the invitation I stood at the opening of the shaft and peered down, down, down into the awful blackness beneath, and descried the faintest glimmer about—well, about five miles off it looked to me, and I must confess it looked just a little hazardous.

But who hasn't read that "faint heart never won fair lady?" and although there was no fair lady in this case, it is equally true that faint heart never went down a coal mine. All this passed through my mind in a good deal less time than I am taking to tell you, and I looked the superintendent square in the eye and said: "YES!" (You will please put that yes in capitals, as I spoke it awfully brave). "Well, come up to the office," said Mr. B., "and I will give you a rubber coat and an old hat and a lamp." I followed and doffed my "store clothes" and donned the miner's costume. Then we returned to the shaft, and I caught the shadow of a contemptuous smile about the lips of a miner there, who penetrated my thinly disguised assumption of nerve. Nevertheless, I stepped boldly into the bucket, and stood facing Mr. B. when the signal was given for the descent. "W-w-w-hy, this is b-b-b-b etter than a b-b-b-b-alloon, isn't it, and so much safer?" I asked. "I think it is," the superintendent replied. When we had gone down 200 feet I looked up. The opening of the shaft had decidedly shrunk. I wondered there were not more accidents, and spoke of it. Mr. Bramley told me a man had fallen into the shaft some time ago. It happened on a Sabbath morning. The cable was hanging loosely down the shaft, and had fallen against the side of the shaft. The man fell but 200 feet and struck against the cable, and without anything to hold him, apparently, he fell no further. The cable was hauled up, and the man was still on it, caught just above the hip, yet there was no bruise on him, and his garments were not caught on the cable. Of course he was quite dead, but an instance of a man falling 200 feet and catching on nothing, as it were, is without parallel. While this instance was being related we were still descending. Looking upward at a distance of 700 feet from the surface I saw but the faintest gleam of light. At my side was a tunnel running off into the drain connecting with the pump in the yard above. I could hear the miners at work more than 600 feet below me picking away, but the sounds were faint, and the suggestion ghostly. Little time for reflection, however. We were soon at the bottom, 1335 feet from the surface—at the bottom of the deepest shaft ever sunk in an American coal mine! Here, in a cavern of solid rock, were about twenty miners at work, blasting and shoveling the broken rock into the buckets as they descended from above. In the course of my travels, which have not been confined to a narrow compass by any means, I have been in some strange places, and have frequently been impressed with the wonders achieved by the mere force and persistency of that wonderful animal man; but never have I been so solemnly impressed with the truth that nothing is impossible to pluck and intelligence on this planet. It is, perhaps, considered a work of no especial merit to sink a coal shaft. Familiarity breeds contempt. Yet the first coal shaft that was ever sunk was doubtless looked upon as a wonder. It was a wonder then; it is a wonder now. Usually coal shafts are not sunk lower than 600 feet. The first good vein struck by the drills has been considered the vein *par excellence*, but the diamond drill has changed all this. Had the Chief Engineer of the Philadelphia and Reading Coal and Iron Company been compelled to depend on the old system of drilling, *i. e.*, by hand, the Mammoth Vein had not been found.

The invention of the diamond drill has changed old methods. Hereafter mining engineers will bore till they reach China or "some other seaport town," but they will exhaust the remotest possibilities of "bonanza." With them there will be "beneath each deep a lower deep," and some one of Dante's Inferno heroes, looking up from his bed of woe, will descry through the sulphurous clouds above him the onward march of the diamond drill, and if he don't look sharp it will put his eye out. Where we stood, at the bottom of the shaft, in a cavern 12 feet square, I noticed a stream of water coming up through a hole in the rock. Noticing my puzzled look, Mr. Bramley asked what I thought it meant. I thought it was another miracle, and wanted to know who smote the rock. "This," said he, "is the hole made by the drill. We have bored 600 feet below where we now stand, and have located the Mammoth vein." A miner, stooping, touched the stream with the flame of his lamp. A blue flame arose in fitful jerks, and, the lamp being removed, it died out. "Gas?" I asked. "Yes, 250 feet lower is situated the Primrose Vein. This will be reached by July next, and the Mammoth Vein will be reached from that point by tunnelling. This unequaled seam of coal will be mined north and south from the bottom of the shaft. In years to come the miners will have reached a point under the town of Pottsville, in one direction, and a mile or two under the hills in a parallel line, in another. It has been ascertained that the vein is *more than 50 feet thick!* It is, of course, practically inexhaustible, and, although more than $1,500,000 will have been expended in sinking the two shafts, and five years of incessant labor, day and night, contributed to the work, the money will return a thousand fold. When both the east and west shafts are in working order, the company will take out 1000 tons per day, or 3,500,000 tons in 10 years. Suppose they sell this at a profit of $2 per ton, the investment will have paid pretty well, will it not?"

Experienced coal operators know quite well how much time was required to sink a shaft with the old fashioned hand drill to aid them. But this drawback has been permanently overcome by means of the diamond drill, which is operated by compressed air, and which is forced through the layers of slate, rock, coal and conglomerate at the rate of 60 feet per day, and an ingenious arrangement which accompanies it brings up the specimens—in cylindrical form—of the strata through which the drill has passed. I have in my possession a piece of conglomerate, an inch in diameter and an inch and a half in length, which came from a distance of 1925 feet from the surface level. 1-16th of an inch is coal, the remainder is slate, with a fine white vein running through it. The geological student can find no more interesting study than the specimens now in possession of the company at the east shaft. Indeed, I hear that a number of geologists have already visited the works for the purpose of studying these specimens. And while on this subject I respectfully suggest to the managers of the Centennial that nowhere can there be found a more perfect collection of mineral strata than this. There is iron, slate, conglomerate, coal, and in fact every description of mineral property found in this section of Pennsylvania, and all the specimens are in an excellent state of preservation.

I remained at the bottom of the shaft about twenty minutes, but experienced no peculiar sensations on account of the air, the excellent system of introducing air into the mine here in vogue precluding any possibility of suffering the least distress. The return to *terra firma* was unaccompanied by any incident worth mention, and when I once more touched the solid earth my good friend Mr. Bramley congratulated me on having been nearer China, *via* "underground passage," than any other man in America, except the few miners at work in the shaft. Safely "out of the depths" I feel like congratulating myself on the novel experience.

The Italian government is about to try an experiment hitherto new in European armies, if we except the semi-civic force of Switzerland, and one that may possibly bring about a large change in tactics. The Vetterli "repeating" rifle, which is about to be supplied to certain Italian regiments, carries eleven reserve charges in a cylinder placed like a sort of false barrel under the real one. It may be used as an ordinary piece, without any reference to this stock of extra ammunition, which is then locked off; but, by moving a simple bolt piece, the trigger will discharge the whole twelve charges in rapid succession. The Swiss officers are said to be well satisfied with the practice made by the repeater; but their general view is that it is an arm especially suited for troops standing on the defensive. One battalion only of Bersaglieri, at Turin, is to receive it, and give it a fair trial. If it be approved of for such special troops, it is proposed later to supply all these rifle regiments, as well as the new Alpine companies of Chasseurs, with it.

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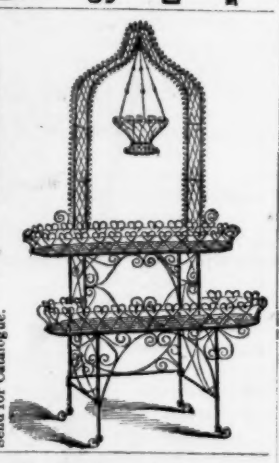

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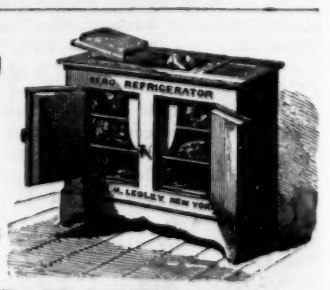

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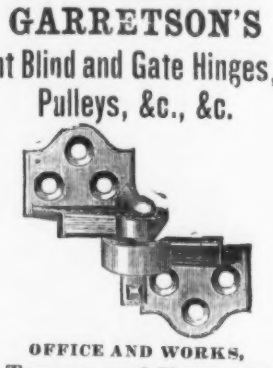

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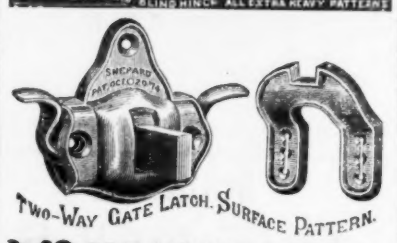

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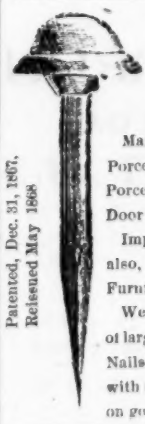

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Iron Manufacture in Missouri.—A General Review of the Metallurgical Districts and their Resources.

BY ADOLF SCHMIDT, PH. D.

(Concluded.)

III. WESTERN ORE REGION.

Extent.—The Western Iron Region of Missouri extends principally along the Osage River, over the counties of St. Clair, Henry, Benton, Morgan, Camden, Miller, Cole, and over the western portions of Maries and Osage counties. The dividing ridge between the Osage and Gasconade waters may be taken as the eastern limit of this region, which limit separates it from the central ore region, just described.

Means of Communication.—The principal medium of communication of this western iron region is at present the Osage River, which is navigable from its mouth, near Osage City, to Warsaw, Benton county, during the larger half of every year. Freight steamers are now running regularly between Osage City and Linn Creek, Camden county, and are soon expected to extend their trips as far as Warsaw. The southern parts of Camden and Miller counties are also accessible from the Atlantic and Pacific Railroads, while the most northern parts of Cole and Osage counties are in contact with the Missouri Pacific Railroad and with the Missouri River.

A narrow gauge railroad has, beside, been planned for some time, and is partially built, running from Jefferson City over Russellville to Versailles (Morgan county), and thence to Warsaw (Benton county). The idea of completing this railroad was lately taken up once more by a company at Jefferson City, and it may be hoped the plan will soon be carried out practically. This would open not only the lead districts of Cole and Morgan, but also the iron fields of Benton, Henry and St. Clair counties, and make them of easier access than heretofore. The nearest railroad to the last named districts is at present the Missouri, Kansas and Texas Railroad.

Resources and their Development.—In the Lower Osage region, between Tuscumbia and Osage City, by far the greater part of the iron ore seems to lie south of the Osage River. A few banks are, however, known north of it in Cole and Northern Miller counties. The western half of Osage county, situated along the Osage River, is, as far as known at present, less rich in iron ore than the eastern half, situated along the Gasconade River. The richest known iron district on the Lower Osage is in Southern Miller county, including a strip of Maries county along its western boundary. About forty deposits are known at present in this district. The ores are both limonites and specular, the former occurring more frequently within a few miles of the river, while the specular ores are found in greater abundance in the southeastern corner of Miller county and in the adjacent portion of Maries county. Several of these deposits have been opened by practical work, and show considerable quantities of iron ore. (The location of the various banks is shown on my map of the lead region of Central Missouri, published with the geological reports of the State for 1874.) Good hard timber is plentiful over the whole district, and is especially fine and large in the Osage bottoms. Favorable furnace sites also exist on the Osage, as well as in some well-watered portions of the highlands.

The remarks just made in regard to timber and furnace sites may be applied with equal propriety to the Middle Osage district between Tuscumbia and Warsaw, and to the Upper Osage district above Warsaw. In both these districts numerous larger and smaller deposits, principally of limonite, are scattered over the country within about ten miles on both sides of the Osage River. Camden county contains, beside the limonites, some deposits of specular ore; and the Upper Osage district contains, beside the limonites, limited beds of red hematite. A few only of these various deposits have been opened by practical work; but a look at the ore bank map, published with the Missouri geological report for 1872, will show that the number of deposits is so large as to warrant a good supply of ore for at least a few charcoal furnaces. The furnaces should, however, be built on the bank of the river, so that they may draw their supplies from any part of the whole district without great expense, and also that they may have a greater facility for shipping their products. Linn Creek, Warsaw, as well as numerous spots between these two towns on the river, would be well suited for the purpose. One furnace, called the Osage Iron Works, was built in 1872 on Boulinger Creek, 12 miles northwest of the town of Linn Creek, in Camden county. Although unfortunately located at some distance from the river, and in a part of the country where ores are not very abundant, this furnace was in successful operation until the late financial crisis.

The construction of the railroad above mentioned, from Jefferson City to Warsaw, will give this latter place considerable advantages for the manufacture and shipment of pig iron.

IV. SOUTHERN ORE REGION.

Several deposits of limonite ore have been reported by B. F. Shumard in Ozark and Douglas counties, on the north fork of White River, and several others are known in Christian and Greene counties. But a thorough investigation of these districts with special reference to iron ores has not yet been made; no reliable judgment can therefore be formed regarding their industrial importance. The name of Southern Iron Ore Region of Missouri has been given to these districts because some iron ore deposits are known to exist there, and because the similarity of the geological formation with that of other iron districts gives hope that more of such deposits may yet be found; and, finally, because these deposits are too remote from all the other districts to be grouped with any of them.

V. THE MANUFACTURING DISTRICTS OF ST. LOUIS AND GRAND TOWER.

St. Louis, including South St. Louis (formerly called Carondelet), and East St. Louis (situated on the eastern bank of the Mississippi in Illinois), has become a very important center for iron manufacture within the last eight or ten years, although neither iron ore nor coal fit for iron smelting is found anywhere in this vicinity. This has been mainly effected through the facilities of communication with the Missouri ore deposits on the one side, and with the excellent industrial coal of Illinois on the other. The fact that these facilities are increasing every year opens promising prospects for a yet grander development of the St. Louis iron industry in the future. Since the completion of the great bridge across the Mississippi, St. Louis and East St. Louis may be considered as one large industrial complex. This complex is at present connected with the southeastern ore region through the Iron Mountain Railroad, with the Central Missouri ore region through the Atlantic and Pacific Railroad, and with the Western ore region through the Osage and Missouri rivers. It is also connected in Illinois with the bituminous coal of Belleville by the St. Louis and Cairo Short Line, and with the Big Muddy field, with its excellent industrial coal, by three routes, namely, the St. Louis and Cairo Short Line, the Cairo and St. Louis Narrow Guage Road, and by the Mississippi River in conjunction with the Grand Tower and Carbondale Railroad.

Excellent coke can be and is obtained at fair rates from beyond Pittsburgh, Pa., partly by the several railroad routes, but mainly by river, the boats being tugged down the Ohio to its mouth and then up the Mississippi. Limestone suitable for fluxing iron ores in the blast furnace is abundant in the vicinity of St. Louis, as it is also in almost all parts of the State south of the Missouri River.

St. Louis district, as above defined, contains at present the following larger establishments for the manufacture of pig iron, or of wrought iron:

Vulcan Iron Works, at South St. Louis, with three blast furnaces and one large puddling and rolling mill.
Jupiter Iron Works, at South St. Louis, with one large blast furnace.
South St. Louis Iron Works, at South St. Louis, with two blast furnaces.
Missouri Furnace Works, at South St. Louis, with two blast furnaces.
Helmbacher Forge, at South St. Louis, with a puddling and rolling mill.
Laclede Rolling Mill, in the northern suburbs of St. Louis.
Meier Rolling Mill, at East St. Louis, Ills.
Bessemer Iron Works, at Bessemer, Ills., opposite South St. Louis, with two blast furnaces.

There are, beside the above, several important forges and mills producing wrought iron for the manufacture of various specialties, such as McDonald's Steam Forge, at South St. Louis; the Harrison Wire Works, in Western St. Louis; and the St. Louis Nut and Bolt Works, at East St. Louis, Ills.

The manufacture of coke from Illinois coal has been started in East St. Louis. This branch of industry is well worth the attention and support of both the pig iron manufacturers and the owners of Illinois coal mines; of the former, because it makes them less dependent on the supply from distant Pennsylvania, and may therefore become of very high importance to them in certain easily imaginable emergencies. The erection of large and efficient coke works would be also advantageous to the owners of coal mines in Illinois, because coke works can use up all the fine coal and pay a fair price for it, while without them the price of slack coal will naturally decrease in proportion to the production of coal in general, and will finally, in places, become entirely unsalable. As it has been practically proved at the coke-works of East St. Louis and of Grand Tower, that the Big Muddy coal, as well as the coal from an extensive district north and east of the Big Muddy field, is able to produce a good furnace-coke, a well arranged and well conducted coking establishment must necessarily become a successful enterprise, provided that reasonable terms can be obtained from the railroads for the transport of coal slack and of coke. The most available place for the erection of coke works is undoubtedly near each mine, because no freight has then to be paid on the large percentage of dirt which the slack often contains, nor on the volatile substances which are separated from the coal in coking. Often, however, the production of slack at a coal mine is not large enough to feed a separate coking establishment; therefore, coke works may also be established in such places where they can with facility draw their raw material from a number of mines. Such works should generally be located as near as possible to the furnaces that use the coke, and for such establishments East St. Louis is undobtedly a favorable locality.

I will add a few remarks on the Grand Tower district of Illinois. This district receives the ores for the manufacture of pig iron almost exclusively from Missouri, especially from the Iron Mountain district (Iron Mountain and Pilot Knob) and from Central Missouri. The ores are shipped over the Iron Mountain Railroad to a point on the Mississippi River south of the city of St. Louis, and are thence taken by boat to Grand Tower. The latter place is situated in Jackson County, Ills., immediately on the river, and is connected by the Grand Tower and Carbondale Railroad with the extensive beds of excellent coal, which have been opened and worked for some time, at several points along the Big Muddy Creek and north of it, and which are known to extend considerably toward the north and east. The coal is of such a quality that it may be used in the bwel-furnace raw, while at the same time it is [illegible] adapted for coking, and makes a pretty good furnace coke.

There are at present two iron works at Grand Tower, namely, the Grand Tower Iron Works, consisting of two blast furnaces and one coking establishment; and the Big Muddy Iron Works, consisting of one blast furnace. Both are situated close to the Mississippi River, and are in immediate connection with the railroad-net of Illinois through the Grand Tower and Carbondale line, which latter intersects the Big Muddy coal field.

CONCLUSION.

From the general review just given it may be seen that the iron industry of Missouri, although not unimportant at present, is capable of considerable further development. Let us hope that a time favorable for this will soon come.

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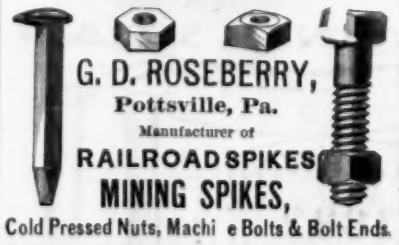
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New Patents.

We take from the records of the Patent Office at Washington the following specifications of certain patents lately issued, which will be found interesting:

IMPROVEMENT IN FIRE CHAMBERS FOR PUDDLING AND OTHER FURNACES.

Specification forming part of Letters Patent No. 160,180, dated February 23, 1875, issued to Henry H. Gilmore, of Cambridgeport, Mass.:

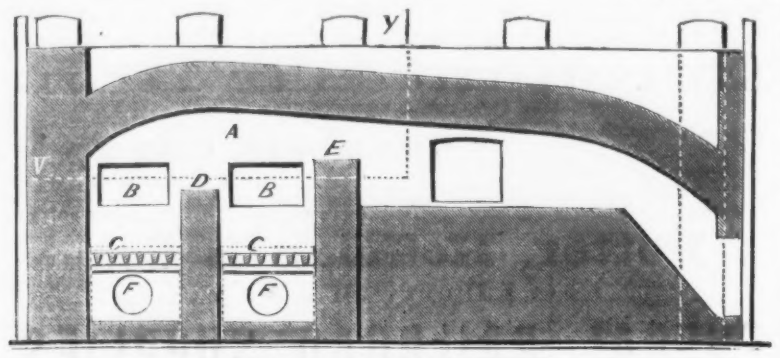
The invention will first be fully described, and then pointed out in the claim.

Figure 1 is a longitudinal sectional elevation of a furnace constructed to be operated according to the invention, taken on line *x x* of Fig. 2. Fig. 2 is a horizontal section, taken on the line *y y* of Fig. 1.

Similar letters of reference indicate corresponding parts.

A is the firing chamber; B, stoke holes; C, separate sections for firing alternately; D, dividing walls, of fire brick or other material, for separating sections; E, bridge walls; F, ash pits.

It is intended to fire each grate alternately, so that one division shall carry a clear flame, that shall intercept and consume the gaseous qualities of the fuel set free by the fresh firing upon the other division, and thus prevent the escape and waste, in the form of heavy black smoke, of much of the valuable combustible portion of the fuel, which is now lost by the present mode of supplying fresh fuel to the whole area of the grate at once. It also prevents the chilling of the furnace which now takes place when the fresh fuel is added, by causing the instantaneous combustion of the gases set free from the fresh fuel, thereby actually increasing the heat while in the act of firing.



IMPROVED REVERBERATORY FURNACE.

The firing holes are, by preference, placed one on each side of the furnace, whereby certain advantages are secured, which will be readily comprehended by practical furnacemen; but they may be arranged in front, and the fire grates and the dividing wall may be arranged at right angles to the bridge wall, if preferred.

By practical use it has been found this improvement in the way of feeding the furnace secures a very considerable economy of fuel. The improvement is equally valuable when applied to furnaces used for making steam, particularly when bituminous coal is used.

This furnace may be worked equally well by draft or by blast.

Claim.—The firing chamber, A, of a reverberatory furnace, divided by walls, D, into a series of connected sections, provided with stoke holes, C, as specified, to enable the sections to be fired successively, and the unconsumed products of combustion, that are always wasted for some time after a furnace fire is started, to be thus burned and utilized.

IMPROVEMENT IN PROCESSES FOR REMOVING TIN FROM TIN SCRAP.

Specification forming part of Letters Patent No. 160,018, dated February 23, 1875, issued to John Holliday and Haydn M. Baker, of Brooklyn, N. Y.

This invention consists in the removal of tin from tin chips or tin scrap, obtained as a residue in working tin plate, by the use of fused alkaline nitrates and other chemical salts, which pass into igneous fusion and retain their chemical constitution at temperatures exceeding the melting point of metallic tin. It also consists in immersing the chips or scrap in a hot bath of any one of these chemical salts while in a state of fusion until the said salts and chips or scraps are of equal temperature, and then removing and suspending the aforesaid chips or scraps above the caldron or kettle for a short time to permit the chemical to drain off and back into the bath, and subsequently, before the temperature has subsided too low, the said chips or scraps are suddenly plunged into water contained in a suitable vessel for the purpose.

Among the chemicals of common occurrence and moderate cost adapted to this method of working may be named caustic soda and potash, known in chemical language as "sodic and potassic hydrates," and the chlorides of calcium and sodium, beside the sulphates of potash and soda; but our experiments have taught us that the alkaline nitrates afford the best results and most opportunities for making accurate and complete separations.

Some skill and experience are required to successfully conduct the manipulations; therefore, an accurate description of the process is necessary to enable others to prosecute the operations by a knowledge obtained from the written record.

Melt a quantity of nitrate of soda in an iron kettle, making a bath whose temperature approximates 800° Fahrenheit. Into this bath a quantity of tin chips or scraps are submerged in the form of bundles, and allowed to remain sufficiently long to attain an equal temperature with the said bath. They are then raised one at a time with a hot fork, and suspended above the bath long enough to allow the fused nitrate to drain off, and subsequently plunged while hot, and above a temperature of 440° Fahrenheit, through a man-hole, into a stout iron tank containing water. They must be tossed or slid into the tank at such an angle as to make their contact with the water, and the consequent explosion, take place out of perpendicular line with the man-hole. This operation disengages most of the tin from the iron, and the said tin falls to the bottom of the tank as feathered or granulated tin.

The decomposing or displacement tank has a screen, sieve, or false bottom placed a few inches from the true bottom. This prevents too great a descent of the bundles, and at the same time allows the granulated and liberated tin to fall through the interstices and become more completely separated from the iron.

The bundles are now to be rattled and shaken to release entangled particles of tin and facilitate their descent to the bottom. They are then to be removed and dried, and subsequently knocked, rattled, and shaken to displace more adhering particles of tin. Afterward, the said bundles must be placed in a reverberatory furnace and brought to a red heat. At this stage of the proceedings a small quantity of dry nitrate of soda is thrown in upon the said bundles, and it soon fuses at this temperature, and then decomposes, furnishing oxygen to any adhering tin, thereby forming stannic acid, that immediately combines with the nascent soda, constructing stannate of soda. The whole charge is now to be withdrawn and placed in hot water, which dissolves the stannate of soda, leaving the oxide of iron and metallic iron as precipitants.

The stannate solution may be removed and evaporated to dryness, yielding stannate of soda, or it may be decomposed by an acid, thereby precipitating stannic peroxide, which may subsequently be collected, dried, and reduced to metallic tin with charcoal, by heat. The metallic iron and oxide of iron may, when dried, also be mixed with the requisite quantity of charcoal or coke, and then fused and run off into pigs by the employment of an appropriate furnace.

The feathered or grain tin from the decomposing tank is collected, melted, and run into bars or ingots at once, furnishing a product representing an acceptable degree of commercial purity.

A large quantity of commercial tin plate has lead alloyed with the tin, but in this process the lead is converted into litharge in the nitrate bath, where it drops to the bottom of the vessel holding the same. In this transformation a trifle of the nitrate of soda is converted to nitrite, but exposure to air during a specific elevation of temperature restores this last substance to the original composition through the absorption of oxygen. For this reason a relatively small quantity of nitrate of soda is sufficient to cleanse many batches of scrap.

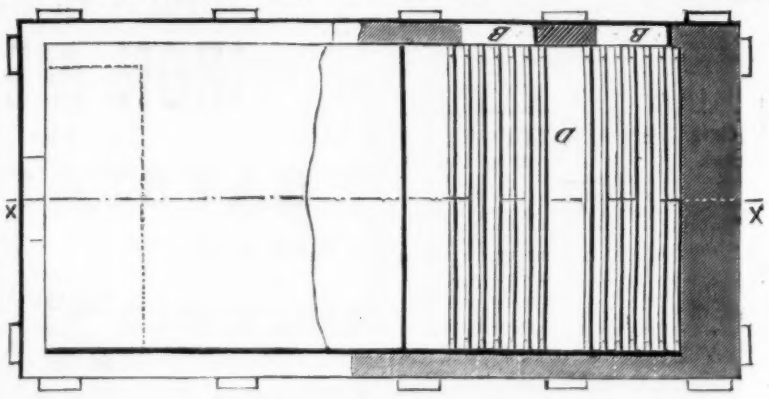


Fig. 2.

Claim.—The process of separating the metallic tin from the iron of tin scrap by heating the said scrap in a bath of fused alkaline nitrate, and then plunging it into water, substantially as described.

The Utility of Iron.

Ovid, in his "Metamorphoses," sings in his poetic Tuscan numbers of three distinctive eras or epochs of mundane transmigration, and characterizes them as the Iron, Brazen and Golden ages of the world. If the graphic Tuscan bard could resume his terrestial existence and look around him, he would emphatically declare that this was truly the "Iron age." Iron is one of the most abundant and widely diffused metals, and is at the present time the most utilized metal known to man. In some shape or form it is largely the constituent of both the organic and inorganic world. The blood that courses through the blood vessels of nearly all animals, contains it; and it gives coloring to the crimson gore; hardly a stone or rock can be found that does not contain a trace of it; and there is hardly anything visible that is wholly devoid of it. The blush of the fragrant rose, glittering in the early dew, owes its brilliancy to iron, and the spectroscope has unerringly detected iron in the substance of the stars. The early history and utility of iron is lost in the remote and obscure past, but it is certain that the Assyrians were expert workers in iron, and combined with bronze in their manufacture of useful and ornamented works. In the tombs of Thebes, which date 4000 years ago, or over 2000 years before the coming of Christ, were found pictorial inscriptions which represented persons using iron utensils.

In the scriptures iron is frequently mentioned in the way of the "frying pan." There is no doubt the Jews acquired the art of manipulating and manufacturing iron from the Egyptians, and that the Egyptians were familiar with iron smelting and manufacture, there is not the slightest doubt, for not long since an ancient abandoned mine was discovered in Egypt, at Hammairi, between the River Nile and the Red Sea. The antiquarian traveler, Layard, found iron weapons of various kinds at Nimroud, and the exhumations at Pompeii indicate a superior workmanship in iron 2000 years ago. Iron is often mentioned by Homer, and that the Greeks knew of iron is indisputable. The great lawgiver, Lycureus, compelled the Spartans to use iron for money, and Plutarch tells us it required a two-ox cart to carry 10 minae, or $150 in gold value. Aristotle speaks of the iron mines of Chalybia and the manner of working the ore, and to this day the mines of Chalybia give name to waters containing iron—"Chalybeate waters." Strabo, who was contemporaneous to the birth of Christ, describes the iron mines then known, and among them those of England, from which it is reasonable to infer that the ancient Britons understood the working of the metal. Between 1500 and 1600, or during the sixteenth century, slag heaps were discovered in Norway and Sweden, also in France and Silesia, which upon examination was proven to be 600 years old. Among the earliest articles cast from iron were guns, and in 1490, two years before Christopher Columbus sailed on his voyage of discovery to this Western World, stoves were made of iron in Alsace, France, and in 1550 George Agricola published a book—"De, Re, Metallica," the first treatise on metal and its manufacture ever known. In England a cannon was cast in 1535, and the name "cannon" was given to it from its resemblance to a hollow reed or canna. The ecclesiastical laws or rules governing the ancient church and clergy of England were enclosed and preserved in a hollow tube or reed, and they also derived the appellation of "cannons" from the tube or reed containing them, and are so called to-day.

The manufacture of iron in the United States dates from a period very soon after the settlement of the country. Three years after the settlement of Jamestown, in Virginia, Sir Thomas Gates testified before the council in London "that in the country (Virginia) there were divers minerals, especially iron ore," and in 1620 we find among those recently sent out to the colony, there "out of Sussex about 40, all famed to iron works." In the History of Virginia, by Beverly, iron works are mentioned as being near Falling Creek, in Jamestown River. In May, 1621, all the colonial iron workers were murdered by the Indians, and by this interruption iron manufacture was not revived until about 1712, nearly one hundred years. In a pamphlet written by one Edward Williams, and published in London in 1650, of the title of "Virginia," more especially the Southern part thereof, it is stated, speaking of iron, "Neither does Virginia yield to any other province whatsoever in excellency and plenty of this ore, and I promise myself extraordinary success and game if this noble and useful staple be but vigorously followed." In 1627, the General Court of Massachusetts granted to one Abraham Shaw, "one-half of any coles or yron stone which shall bee found in any common grounde which is in the countrye's disposing." Among the earlier settlers of this country domestic utensils made of iron were highly prized for their value and rarity. The wills and inventories of persons of that period frequently mention and bequeath such articles as "iron pots" and "iron tea kettles," to relatives and friends.

During this century iron manufacture has steadily and rapidly increased, and American genius and industry has been instrumental in the improved methods of iron manufacture and the endless uses of the manufactured metal.

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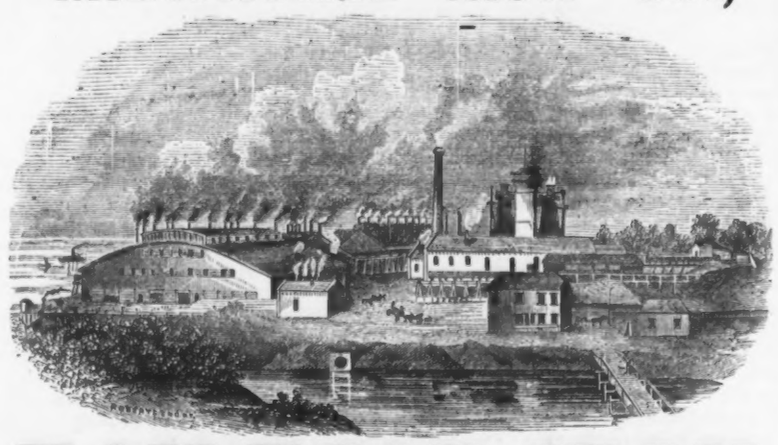

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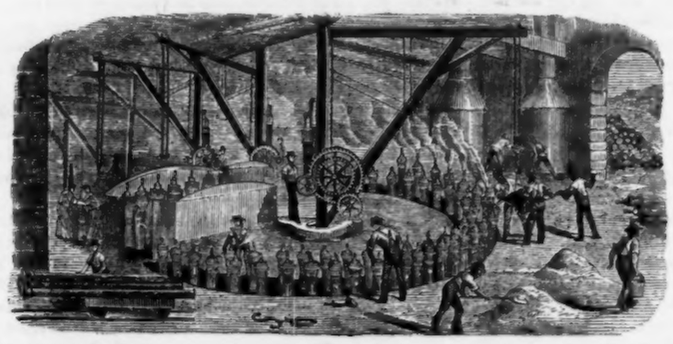

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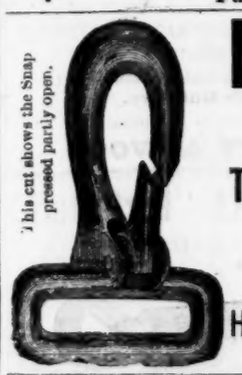

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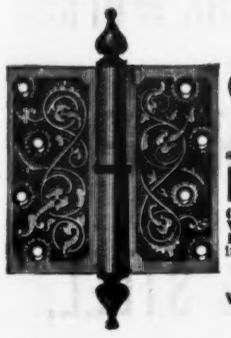

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Some Recent Developments in the Technology of Iron.

III.

It is now fifty years since it was observed that cyanide of potassium was formed by passing nitrogen over charcoal heated to redness. As coke also contains potassium salts, though to a less extent than charcoal, and the remarkable reducing power possessed by this salt had been long previously familar to chemists, it is remarkable that it should have been left for Bunsen and Playfair to first draw attention to its operative presence in the blast furnace, twenty years later. The observation made by these investigators that free cyanogen was also present in the lower part of the furnace, has been questioned by later writers, as, though there can be no question of the power of carbon and nitrogen to unite under the influence of the disposing action of alkaline bases with which they may simultaneously unite, we have no knowledge of any direct union taking place between these elements to form free cyanogen, apart from this determining influence. It is also suggested that the cyanogen detected by Bunsen and Playfair was due to a decomposition of the alkaline cyanide having taken place during its passage through the collecting tube. Still, it is possible that at the intense white heat prevailing in the hearth, in conjunction with the presence of minutely divided carbon from the dissociation of carbonic acid, such direct union may take place. Of the remarkable power of cyanogen there can be no question. In fifteen minutes a mixture of one volume cyanogen with two volumes of CO_2 absorbed under a bright red heat, in one instance 3⅓ per cent., in another 25 per cent. of the total oxygen in calcined Cleveland; while even when the proportion of carbonic acid gas was increased to six times the volume of the cyanogen, not less than 25 per cent. of the total oxygen was removed in less than three hours at a red heat, the reduction being accompanied by a large deposition of carbon. This exhibits in cyanogen a remarkable capacity for neutralizing the oxidizing effect of CO_2, when we find that a mixture in which CO was accompanied by only one-half its volume of CO_2 was considerably less effective. The products of reduction by cyanogen are probably CO_2 and nitrogen. Of the presence of alkaline cyanides we are absolutely assured, the only doubtful point being their exact amount, and to this question we shall return later. The reducing power of potassic cyanide, the salt most largely formed, is familiar to every one who has any acquaintance with blow pipe analysis. The cyanide takes up from the oxide with which it is in contact an atom of oxygen, forming cyanate. It is less obvious, however, what is the character of the decomposition which overtakes the cyanate thus formed. In dry air some authorities consider it to be stable at all temperatures, though Mr. Bell mentions that at a high temperature it is split up into potassium vapor, CO and N, or perhaps into potassic-oxide, carbon, and nitrogen. Bunsen and Playfair are supported by Dr. Percy in the assertion that the products of its decomposition are potassic carbonate, carbonic acid and nitrogen; but as an intermediate stage, the aqueous vapor entering at the tuyeres would probably convert a portion at least of the cyanate into potassic-carbonate, ammonic carbonate, and paracyanogen. The fact appears to have been lost sight of that ignition in a crucible with charcoal readily reduces the cyanate to cyanide, and that passing through a column of ignited carbon would doubtless have the same effect. As an instance of the auxiliary effect of potassic cyanide, we may quote an experiment of Mr. Bell's, in which the reduction effected by carbonic oxide passing over oxide mixed with an equal weight of cyanide was 50 per cent. greater than when no cyandide was used; but here the conditions were not the most favorable to the action of the cyanide, the temperature not exceeding 417° C.

We may now approach the consideration of the effect on calcined ores of such a gaseous mixture as escapes from the mouth of a blast furnace, regarding it, for the sake of simplicity, as constituted of carbonic acid, carbonic oxide, and nitrogen only. It should, however, be understood that this hypothetical composition is fictitious, inasmuch as the presence of a small percentage of hydrogen is disregarded, while, with coal burning furnaces, there would be also present a large proportion of hydro-carbons to modify the result. The first two experiments quoted are those of MM. Tunner and Ebelmen, respectively. For the subsequent ones we are again indebted to Mr. Bell:

Mode of Exposure.	Temperature.	Volumes of N for 100 of CO.	Volumes of CO_2 for 100 CO.	Time of exposure in hours.	Per cent. of O remov'd
In a perforated iron box or cage.	Rising to 640° C.	540	125	1	nil.
" " "	Under redness.	260	69	2	nil.
In a flat tray exposed to direct action of gas	270° C.	264	40	24	3·7
In a flat tray exposed to direct action of gas	420° C.	...	...	24	36
In a flat tray exposed to direct action of gas	425°	184	18	24	41
In a flat tray exposed to direct action of gas	280°	...	...	1	7·7
In a flat tray exposed to direct action of gas	420°	...	...	6	54
In a flat tray exposed to direct action of gas	280°	264	40	1	6
In a flat tray exposed to direct action of gas	.....	229	44	2	4·7

From these experiments we gather that the mode of exposure adopted by Tunner & Ebelmen was not such as would be likely to give accurate results, as free exposure to gases induces far more rapid reduction than when the oxide is in any way enclosed. It also appears that when the proportion $\frac{CO_2}{CO}$ in the gases equals ·4, there is a certain reduction even at so low a temperature as an average of 295°, or thereabouts, which is much more considerable when this proportion is small or the temperature higher. All deductions as to the action of the gases at different depths and temperatures in the furnace having been based on experiments in which the ore operated on was lowered with the charges in a perforated box, and the samples were exposed to reoxidation while being drawn up through gases containing much CO_2—a method which, it seems, would always give a much lower coefficient of reduction than actually obtains—it will be necessary to substitute for the determination, thus arrived at, others in which the ores experimented on were exposed without any protecting case in which carbonic acid might accumulate, and the free access of the gases be prevented. Such information is afforded by experiments at the Clarence and Wear furnaces, in which the furnace was pierced at various depths, and porcelain tubes, containing the fragments of ore, were inserted, forming channels through which the gases rushed with considerable velocity.

At a point 4 feet from the top, with gases averaging 23 volumes of CO_2 to 100 of CO—*i. e.*, where $\frac{CO_2}{CO} = ·23$—temperature probably from 600° to 800° C., calcined Cleveland stone lost about 12 per cent. of its original oxygen in two hours. At 10 feet from the top, where the proportion $\frac{CO_2}{CO} = ·07$, or thereabouts, and the heat had risen to a cherry red, no less than 76 per cent. of the original oxygen was lost in the same time. At 21 feet from the top, with a very bright red heat, and a very small amount of CO_2 $\left(\frac{CO_2}{CO}\right.$ being about $\left.0·3\right)$ no greater average effect was observed. But in the Wear furnace, at a depth of 25 feet, $\frac{CO_2}{CO}$ being ·07, 84 per cent. of the original oxygen was abstracted; an amount that was not exceeded at a depth of 52 feet, with only a trifling amount of CO_2 present; or even at a depth of 70 feet, where *no* CO_2 could be detected, and the temperature would be approaching its maximum. With regard to these figures, which show reduction to proceed far more rapidly than former observations justify us in believing could be the case, it may be remarked that Mr. Bell has not recognized one condition, which may induce us to consider them as representing a state of affairs more favorable to reduction than exists in the blast furnace itself. A short tube inserted in the side of the furnace presents far less resistance to the escape of the gases than the compact column of materials through which they would have to make their way to escape at the furnace throat. This difference of resistance is greater as the tube is inserted lower in the structure, and it results that the current of gas through the tube will have a greater velocity than that of the gas ascending through the shaft, and consequently a more considerable volume of gas will act on the ore in an unit of time than would be the case in a vertical section of the interior of equal diameter. However, even after allowing for this source of exaggerated action, we must be struck with the facility with which the elimination from the ore of all but the last 10 or 20 per cent. of oxygen is effected, when the temperature approaches redness, and CO is to CO_2 in about the proportion of ten to one.

It will be useful to compare the proportion which carbonic acid bears to carbonic oxide at different depths in furnaces burning different fuels:

$\frac{CO_2}{CO}$ =		Depth from top in feet.	
8·4	26	15	Veckerhagen charcoal burning.
8·35	8·50	7·50	
8·50	9	12	
6	6	8¾ above tuyere.	
3	0·37	0	
7·25	0-25	10-25	Afreton coal-burning.
5	17	24	Depth from top in feet.
14·22	9·28	2·33	Clerval charcoal. 28°?
5½	14½	17½	Depth from top in feet.
25-100	2-100	3-100	Clarence coke. 48'.
4¾	15¾	21¼	Depth from top in feet.
8·8 100	6·6 100	2·3 100	Wear coke. 80'.
16¾	25	52	Depth from top in feet.

Though the decrease in the proportion of carbonic acid as the depth from the top increases is invariable, the progression does not take place in anything approaching a uniform ratio, and fluctuates considerably without any apparent cause. However, on examining complete analyses of gases drawn from different depths there is observable a peculiarity in their constitution to which attention was long since directed by Ebelmen, and also by Bunsen and Playfair, whose respective explanations of the phenomenon were, however, not accepted by Dr. Percy. This peculiarity, which is noticeable to a greater or less degree in all published analyses, consists in the proportion of oxygen to nitrogen in the gases drawn from the vicinity of the tuyeres being considerably, greater than the proportion in which they are found in air (even after allowing for the oxygen introduced by the moisture of the blast) a disproportion which diminishes rapidly in the ascent. Now this fact is susceptible of two explanations—either oxygen is liberated from the solid contents of the hearth, as Ebelmen suggests, or nitrogen is abstracted from the blast to enter into a state of combination which escaped detection in the analytical process adopted, which was Bunsen's contention. It however, escaped notice that as the gases ascended from the neighborhood of the tuyeres there was also a disappearance of carbon. Combining these observations, Mr. Bell draws from them certain deductions which have the advantage of offering, at all events, a competent solution of the problem. The excess of oxygen may arise, he suggests, partly from the deoxidation which would take place at the high temperature of the hearth, of phosphoric and sulphuric acids and silica; a smaller contingent from the elimination in the hearth of the last traces of oxygen (due to a secondary oxidation) from the iron; and, lastly, a further liberation of oxygen may occur from the combination of cyanogen with alkali, which had been brought down into the hearth as oxides or carbonates. The missing carbon is assumed to enter into combination with nitrogen to form cyanogen, and—without entering into the elaborate investigation of analyses necessary to prove this assumption—it appears that the quantity of cyanide found in one of the samples from the Wear furnaces is enough to account for the whole of the carbon withdrawn from the gases. Allowing this to represent an average condition, it would give 3½ cwt. of cyanogen formed per ton of pig, or ten times the quantity which Bunsen and Playfair found, and considered to be an important agent in the reduction of the iron.

There still remain to be noticed two closely-related physico-chemical phenomena, which play no inconsiderable part in the process of iron smelting; they are those attending the reduction of carbonic acid by heated carbon and the decomposition of limestone by heat. That carbonic acid can be decomposed by solid carbon at a high temperature with the formation of two volumes of carbonic oxide, is indeed an elementary chemical fact. But it becomes of importance to ascertain the temperature at which this action commences and the influence of the mechanical aggregation of the carbon by which it is brought about. At a white or very bright red heat the reduction is rapid indeed, in the former case, almost instantaneous; at a bright red only about 6 per cent. of the CO_2 passed over fragments of hard coke was converted in fifty minutes, but pulverulent deposited carbon and soft coke were much more rapidly taken up, under the same circumstances. Even at a dull red the action was well defined, while a very soft coke deoxidizes CO_2 to a considerable extent even at 417° C., at which latter temperature a hard coke was practically unacted on. It would be anticipated that nascent carbonic acid would be particularly ready to part with its oxygen, and it has been found by heating powdered coke with powdered marble that 25 per cent. of the liberated gas was reduced, at a red heat, in twenty minutes.

The temperature at which the decomposition of limestone takes place is equally incapable of a simple statement. It does not begin to lose its carbonic acid before a low red heat, and the decomposition speedily ceases if the temperature be not raised further. Schintz states that it requires two hours' exposure to a temperature of 1000° C. to effect complete calcination; but if the calcination takes place in a vacuum the evolution of gas will cease entirely when the gas assumes any considerable tension. Thus, before the CO_2 has attained a tension nearly equal to that of the atmosphere a temperature of 1100° or more would fail to complete the process; while, at a red heat, quicklime will absorb carbonic acid to a considerable extent with avidity. As the presence of CO_2 has a *retarding* effect on the decomposition of limestone, so hydrogen (which possesses the power of splitting up carbonic acid) *accelerates* its decomposition. Thus specimens of limestone, at a bright red heat, in a current of carbonic acid, air, and hydrogen gave off CO_2 respectively, to the extent of 10 per cent., 13 per cent., and 40 per cent. of their weights. From a similar cause, carbon itself has an influence in promoting the decomposition of limestone, on which sufficient stress has not been laid. Collating these facts, we may conclude that wherever CO_2 is liberated from limestone it will act as a solvent on carbon, though the limits of the action will be determined by the physical condition of the carbon.

With regard to the temperature of the blast furnace interior at different levels, only the most general statements can be made. It appears that at a point a few inches above the tuyeres it is at its maximum; wrought iron being nearly instantaneously melted even at the tuyere level, the temperature can only be inferred to be somewhere about 2000° C. There is another point below the tuyeres where the heat is also more intense than at the actual tuyere level. The decrease from the hearth to the furnace top is tolerably regular, but the stages of progression will vary with each individual furnace. A bright red should prevail to a point beyond the boshes, while a crucial test of economy of working consists in the temperature of the escaping gases, which may vary between 100° C. to 550° or 600°; 400° C. is an average temperature in the north of England.

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(To be continued.)

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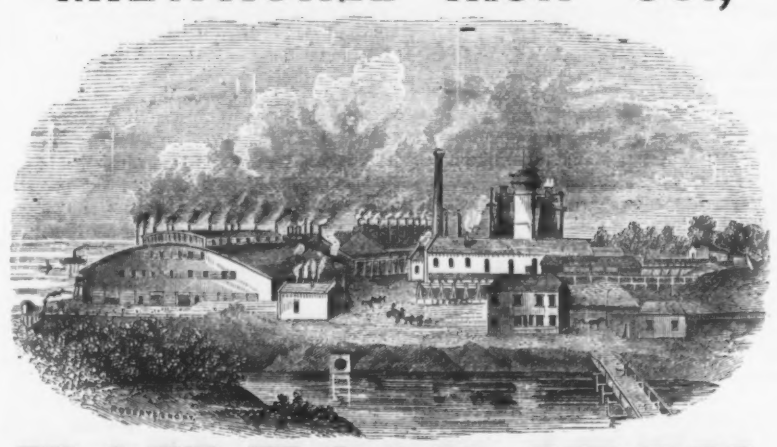

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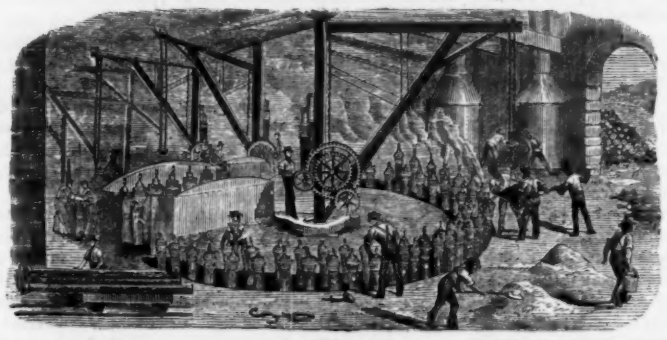

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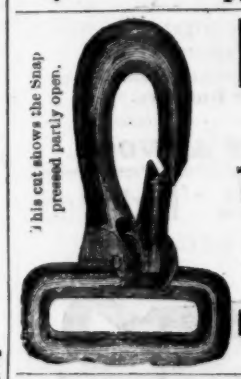

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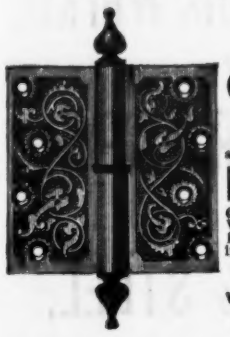

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III.

It is now fifty years since it was observed that cyanide of potassium was formed by passing nitrogen over charcoal heated to redness. As coke also contains potassium salts, though to a less extent than charcoal, and the remarkable reducing power possessed by this salt had been long previously familar to chemists, it is remarkable that it should have been left for Bunsen and Playfair to first draw attention to its operative presence in the blast furnace, twenty years later. The observation made by these investigators that free cyanogen was also present in the lower part of the furnace, has been questioned by later writers, as, though there can be no question of the power of carbon and nitrogen to unite under the influence of the disposing action of alkaline bases with which they may simultaneously unite, we have no knowledge of any direct union taking place between these elements to form free cyanogen, apart from this determining influence. It is also suggested that the cyanogen detected by Bunsen and Playfair was due to a decomposition of the alkaline cyanide having taken place during its passage through the collecting tube. Still, it is possible that at the intense white heat prevailing in the hearth, in conjunction with the presence of minutely divided carbon from the dissociation of carbonic acid, such direct union may take place. Of the remarkable power of cyanogen there can be no question. In fifteen minutes a mixture of one volume cyanogen with two volumes of CO_2 absorbed under a bright red heat, in one instance 3½ per cent., in another 25 per cent. of the total oxygen in calcined Cleveland; while even when the proportion of carbonic acid gas was increased to six times the volume of the cyanogen, not less than 25 per cent. of the total oxygen was removed in less than three hours at a red heat, the reduction being accompanied by a large deposition of carbon. This exhibits in cyanogen a remarkable capacity for neutralizing the oxidizing effect of CO_2, when we find that a mixture in which CO was accompanied by only one-half its volume of CO_2 was considerably less effective. The products of reduction by cyanogen are probably CO_2 and nitrogen. Of the presence of alkaline cyanides we are absolutely assured, the only doubtful point being their exact amount, and to this question we shall return later. The reducing power of potassic cyanide, the salt most largely formed, is familiar to every one who has any acquaintance with blow pipe analysis. The cyanide takes up from the oxide with which it is in contact an atom of oxygen, forming cyanate. It is less obvious, however, what is the character of the decomposition which overtakes the cyanate thus formed. In dry air some authorities consider it to be stable at all temperatures, though Mr. Bell mentions that at a high temperature it is split up into potassium vapor, CO and N, or perhaps into potassic-oxide, carbon, and nitrogen. Bunsen and Playfair are supported by Dr. Percy in the assertion that the products of its decomposition are potassic carbonate, carbonic acid and nitrogen; but as an intermediate stage, the aqueous vapor entering at the tuyeres would probably convert a portion at least of the cyanate into potassic-carbonate, ammonic carbonate, and paracyanogen. The fact appears to have been lost sight of that ignition in a crucible with charcoal readily reduces the cyanate to cyanide, and that passing through a column of ignited carbon would doubtless have the same effect. As an instance of the auxiliary effect of potassic cyanide, we may quote an experiment of Mr. Bell's, in which the reduction effected by carbonic oxide passing over oxide mixed with an equal weight of cyanide was 50 per cent. greater than when no cyanidide was used; but here the conditions were not the most favorable to the action of the cyanide, the temperature not exceeding 417° C.

We may now approach the consideration of the effect on calcined ores of such a gaseous mixture as escapes from the mouth of a blast furnace, regarding it, for the sake of simplicity, as constituted of carbonic acid, carbonic oxide, and nitrogen only. It should, however, be understood that this hypothetical composition is fictitious, inasmuch as the presence of a small percentage of hydrogen is disregarded, while, with coal burning furnaces, there would be also present a large proportion of hydro-carbons to modify the result. The first two experiments quoted are those of MM. Tunner and Ebelmen, respectively. For the subsequent ones we are again indebted to Mr. Bell:

Mode of Exposure.	Temperature.	Volumes of N for 100 of CO.	Volumes of CO_2 for 100 CO.	Time of exposure in hours.	Per cent. of O remov'd
In a perforated iron box or cage.	Rising to 640° C.	540	135	1	nil.
" "	Under redness.	260	62	2	nil.
" "	270° C.	204	40	24	3·7
In a flat tray exposed to direct action of gas	430° C.	...	...	96	28
" "	425°	184	18	24	41
In a flat tray exposed to direct action of gas	290°	...	...	1	7·7
" "	430°	...	...	6	54
In a flat tray exposed to direct action of gas	293°	204	46	1	5
In a flat tray exposed to direct action of gas	.....	239	44	2	4·7

From these experiments we gather that the mode of exposure adopted by Tunner & Ebelmen was not such as would be likely to give accurate results, as free exposure to gases induces far more rapid reduction than when the oxide is in any way enclosed. It also appears that when the proportion $\frac{CO_2}{CO}$ in the gases equals ·4, there is a certain reduction even at so low a temperature as an average of 295°, or thereabouts, which is much more considerable when this proportion is small or the temperature higher. All deductions as to the action of the gases at different depths and temperatures in the furnace having been based on experiments in which the ore operated on was lowered with the charges in a perforated box, and the samples were exposed to roxidation while being drawn up through gases containing much CO_2—a method which, it seems, would always give a much lower coefficient of reduction than actually obtains—it will be necessary to substitute for the determination, thus arrived at, others in which the ores experimented on were exposed without any protecting case in which carbonic acid might accumulate, and the free access of the gases be prevented. Such information is afforded by experiments at the Clarence and Wear furnaces, in which the furnace was pierced at various depths, and porcelain tubes, containing the fragments of ore, were inserted, forming channels through which the gases rushed with considerable velocity.

At a point 4 feet from the top, with gases averaging 23 volumes of CO_2 to 100 of CO—*i. e.*, where $\frac{CO_2}{CO} = ·23$—temperature probably from 600° to 800° C., calcined Cleveland stone lost about 12 per cent. of its original oxygen in two hours. At 10 feet from the top, where the proportion $\frac{CO_2}{CO} = ·07$, or thereabouts, and the heat had risen to a cherry red, no less than 76 per cent. of the original oxygen was lost in the same time. At 21 feet from the top, with a very bright red heat, and a very small amount of CO_2 $\left(\frac{CO_2}{CO}\right.$ being about $\left.0·3\right)$ no greater average effect was observed. But in the Wear furnace, at a depth of 25 feet, $\frac{CO_2}{CO}$ being ·07, 84 per cent. of the original oxygen was abstracted; an amount that was not exceeded at a depth of 52 feet, with only a trifling amount of CO_2 present; or even at a depth of 70 feet, where *no* CO_2 could be detected, and the temperature would be approaching its maximum. With regard to these figures, which show reduction to proceed far more rapidly than former observations justify us in believing could be the case, it may be remarked that Mr. Bell has not recognized one condition, which may induce us to consider them as representing a state of affairs more favorable to reduction than exists in the blast furnace itself. A short tube inserted in the side of the furnace presents far less resistance to the escape of the gases than the compact column of materials through which they would have to make their way to escape at the furnace throat. This difference of resistance is greater as the tube is inserted lower in the structure, and it results that the current of gas through the tube will have a greater velocity than that of the gas ascending through the shaft, and consequently a more considerable volume of gas will act on the ore in an unit of time than would be the case in a vertical section of the interior of equal diameter. However, even after allowing for this source of exaggerated action, we must be struck with the facility with which the elimination from the ore of all but the last 10 or 20 per cent. of oxygen is effected, when the temperature approaches redness, and CO is to CO_2 in about the proportion of ten to one.

It will be useful to compare the proportion which carbonic acid bears to carbonic oxide at different depths in furnaces burning different fuels:

Depth from top in feet.	$\frac{CO_2}{CO}$ =	
26	8-4	Veckerhagen charcoal burning.
15	3	Depth from top in feet.
5¾ above tuyere.	6	
0-37	7-25	Afreton coal-burning.
34	5	Depth from top in feet.
0-35	14-22	Clerval charcoal. 28'?
20	5½	Depth from top in feet.
5-100	23-100	Clarence coke. 48'.
27¼	4¼	Depth from top in feet.
0-100	8·8 100 2·3 100 6·6 100	Wear coke. 80'.
70	16½	Depth from top in feet.

Though the decrease in the proportion of carbonic acid as the depth from the top increases is invariable, the progression does not take place in anything approaching a uniform ratio, and fluctuates considerably without any apparent cause. However, on examining complete analyses of gases drawn from different depths there is observable a peculiarity in their constitution to which attention was long since directed by Ebelmen, and also by Bunsen and Playfair, whose respective explanations of the phenomenon were, however, not accepted by Dr. Percy. This peculiarity, which is noticeable to a greater or less degree in all published analyses, consists in the proportion of oxygen to nitrogen in the gases drawn from the vicinity of the tuyeres being considerably, greater than the proportion in which they are found in air (even after allowing for the oxygen introduced by the moisture of the blast) a disproportion which diminishes rapidly in the ascent. Now this fact is susceptible of two explanations—either oxygen is liberated from the solid contents of the hearth, as Ebelmen suggests, or nitrogen is abstracted from the blast to enter into a state of combination which escaped detection in the analytical process adopted, which was Bunsen's contention. It however, escaped notice that as the gases ascended from the neighborhood of the tuyeres there was also a disappearance of carbon. Combining these observations, Mr. Bell draws from them certain deductions which have the advantage of offering, at all events, a competent solution of the problem. The excess of oxygen may arise, he suggests, partly from the deoxidation which would take place at the high temperature of the hearth, of phosphoric and sulphuric acids and silica; a smaller contingent from the elimination in the hearth of the last traces of oxygen (due to a secondary oxidation) from the iron; and, lastly, a further liberation of oxygen may occur from the combination of cyanogen with alkali, which had been brought down into the hearth as oxides or carbonates. The missing carbon is assumed to enter into combination with nitrogen to form cyanogen, and—without entering into the elaborate investigation of analyses necessary to prove this assumption—it appears that the quantity of cyanide found in one of the samples from the Wear furnaces is enough to account for the whole of the carbon withdrawn from the gases. Allowing this to represent an average condition, it would give 3½ cwt. of cyanogen formed per ton of pig, or ten times the quantity which Bunsen and Playfair found, and considered to be an important agent in the reduction of the iron.

There still remain to be noticed two closely-related physico-chemical phenomena, which play no inconsiderable part in the process of iron smelting; they are those attending the reduction of carbonic acid by heated carbon and the decomposition of limestone by heat. That carbonic acid can be decomposed by solid carbon at a high temperature with the formation of two volumes of carbonic oxide, is indeed an elementary chemical fact. But it becomes of importance to ascertain the temperature at which this action commences and the influence of the mechanical aggregation of the carbon by which it is brought about. At a white or very bright red heat the reduction is rapid indeed, in the former case, almost instantaneous; at a bright red only about 6 per cent. of the CO_2 passed over fragments of hard coke was converted in fifty minutes, but pulverulent deposited carbon and soft coke were much more rapidly taken up, under the same circumstances. Even at a dull red the action was well defined, while a very soft coke deoxidizes CO_2 to a considerable extent even at 417° C., at which latter temperature a hard coke was practically unacted on. It would be anticipated that nascent carbonic acid would be particularly ready to part with its oxygen, and it has been found by heating powdered coke with powdered marble that 25 per cent. of the liberated gas was reduced, at a red heat, in twenty minutes.

The temperature at which the decomposition of limestone takes place is equally incapable of a simple statement. It does not begin to lose its carbonic acid before a low red heat, and the decomposition speedily ceases if the temperature be not raised further. Schintz states that it requires two hours' exposure to a temperature of 1000° C. to effect complete calcination; but if the calcination takes place in a vacuum the evolution of gas will cease entirely when the gas assumes any considerable tension. Thus, before the CO_2 has attained a tension nearly equal to that of the atmosphere a temperature of 1100° or more would fail to complete the process; while, at a red heat, quicklime will absorb carbonic acid to a considerable extent with avidity. As the presence of CO_2 has a *retarding* effect on the decomposition of limestone, so hydrogen (which possesses the power of splitting up carbonic acid) *accelerates* its decomposition. Thus specimens of limestone, at a bright red heat, in a current of carbonic acid, air, and hydrogen gave off CO_2 respectively, to the extent of 10 per cent., 13 per cent., and 40 per cent. of their weights. From a similar cause, carbon itself has an influence in promoting the decomposition of limestone, on which sufficient stress has not been laid. Collating these facts, we may conclude that wherever CO_2 is liberated from limestone it will act as a solvent on carbon, though the limits of the action will be determined by the physical condition of the carbon.

With regard to the temperature of the blast furnace interior at different levels, only the most general statements can be made. It appears that at a point a few inches above the tuyeres it is at its maximum; wrought iron being nearly instantaneously melted even at the tuyere level, the temperature can only be inferred to be somewhere about 2000° C. There is another point below the tuyeres where the heat is also more intense than at the actual tuyere level. The decrease from the hearth to the furnace top is tolerably regular, but the stages of progression will vary with each individual furnace. A bright red should prevail to a point beyond the boshes, while a crucial test of economy of working consists in the temperature of the escaping gases, which may vary between 100° C. to 550° or 600°; 400° C. is an average temperature in the north of England.

In Siemens' electric pyrometer there has been recently placed in the hands of metallurgists a more trustworthy and accurate instrument for the measurement of high temperatures than has hitherto existed: but the differing conditions in different furnaces, and in the same furnace at different times, render isolated observations almost valueless, the average of continuously recorded registrations being the only useful guide.

(To be continued.)

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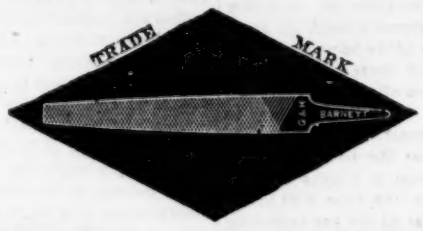

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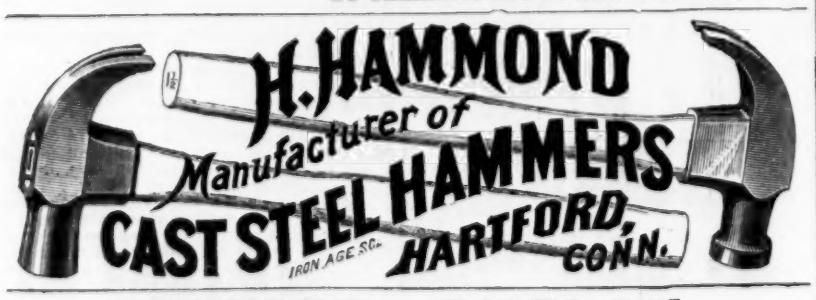

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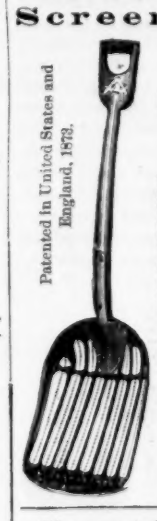

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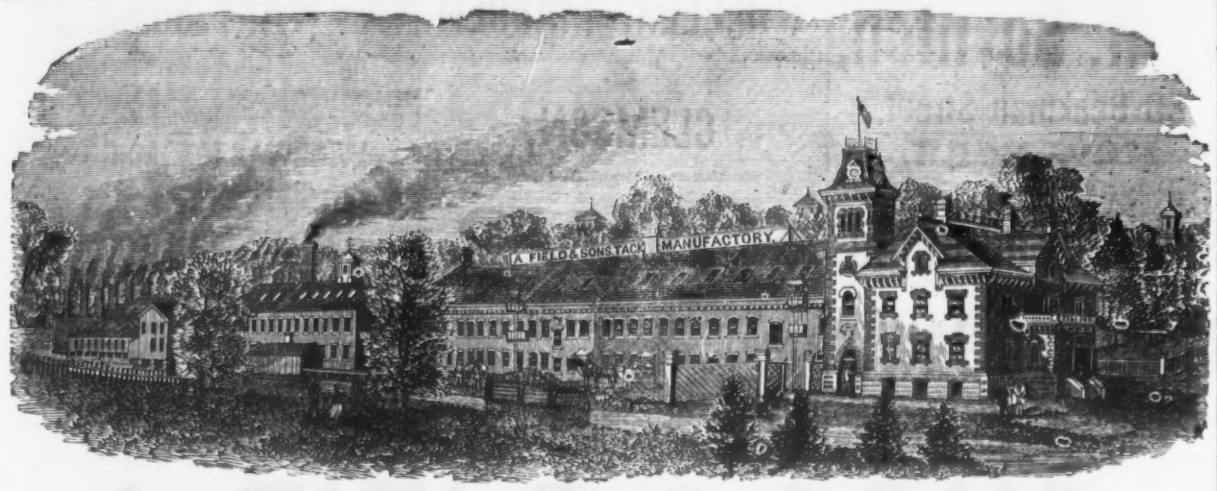

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Have been before the public several years, and have given universal satisfaction. Therefore it is not necessary to make lengthy comments, only to say they are the lightest and strongest mowers in the market; also, for simplicity of construction, durability, and lightness of draft, they are acknowledged to be superior to any machines made. They are sold at *Fair* prices.

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Our Springs are used by the U. S. Government, and various Meteorological and other Scientific Institutions.

Why "Spent Charcoal" has no Power to Blister Steel.

To the Editor of The Iron Age: Blister steel is manufactured by the "cementation process." The operation is conducted in a closed chamber, in which bar iron is imbedded in alternate strata of pulverized charcoal. This chamber or converting pot is then subjected to a red heat for a certain time. When the iron is withdrawn it is found to be blistered, and has increased a little in weight. The charcoal has diminished but little in bulk, but has in a large degree lost its power to convert, and is known by the workmen as "spent charcoal." By an analysis of this "spent charcoal" we find that it contains but a trace of hydrogen, while fresh charcoal contains from 4 to 5 per cent. of hydrogen. Thus it appears that the presence of hydrogen is necessary in charcoal to be used in the cementation process, and in explanation of this phenomenon I offer the following:

All matter exists in one of three states—solid, liquid or gaseous. The state depends upon the temperature to which it is exposed. The temperature to which the iron is exposed in the converting pot is within the range of its solidity, but sufficiently high to vaporize the carbon which exists in chemical combination with hydrogen in the charcoal. And as this hydrocarbon is vaporized it permeates the structure of the iron, the hydrogen uniting with the oxygen present as oxide of iron, reducing it and forming HO. The carbon being relieved and in the nascent state, is absorbed and retained within the physical pores, adding largely to the resultant force of the structure, and correspondingly to its tensile strength. The chemical union forming HO at a temperature of 1500° F. is so rapid, and the oxygen being changed from the solid to the vaporized condition, increasing so largely in bulk, the physical pores are distended, and many of them changed to sensible pores, and finally to blisters. When the hydro carbon is entirely evolved from the charcoal, the heat not being sufficient to vaporize the carbon, and there being no oxygen present for its combustion, the charcoal remains in the solid state, and has no effect on the iron whatever. ATOM.

July 25, 1873.

FUSION.

All matter exists in one of three states—solid, liquid or gaseous. The state depends upon the temperature to which it is exposed. Considering iron in its solid state, the molecules composing it are held in a certain co-relative position by their resultant force. And when the temperature is increased the molecules are pushed further apart, and the resultant force reduced; if this is continued, and the temperature raised to such a degree as to reduce the resultant force to a less modulous than the force of gravity, gravitation overcomes attraction, and the molecules are comparatively independent of each other, and assume a liquid condition, and this modulation of the forces produces the phenomenon of fusion.

The physical structure of good wrought iron is of such an arrangement, and its resultant force so strong that its fusion has not yet been effected by any temperature produced by furnace heat, when entirely free from other bodies. But when wrought iron has absorbed and retained carbon within its physical pores (as is the case in blister, or cast steel), the position and character of the resultant force is changed. In the wrought iron the forces were exerted between the molecules, consequently the distance over which they had to act was from one molecule to the other; but in the steel the atoms of carbon existing in the physical pores, it follows that the forces are exerted between the molecules and the atoms of carbon, consequently shortening the distance by one-half which the forces must act across. Therefore, though the resultant force of steel is greatly larger than that of iron, its fusion is effected, because for every additional degree of heat to which the steel is subjected the molecules in it are pushed twice as far from each other as those in wrought iron under same temperature. The point at which steel melts depends upon the amount of carbon it contains; the temperature ranges from 3000° to 5000° Fah., the steel having the least carbon requiring the highest heat. ATOM.

July 23, 1873.

HEAT.

Taking as a thermal unit the heat necessary to raise the temperature of a pound of water through one degree centigrade, it has been determined by experiments, conducted with great care, that the combustion of one pound of bituminous coal to carbonic oxide gives 5600 units of heat; and the combustion of one pound of carbonic oxide to carbonic acid gives 2400 units, while the combustion of one pound of the coal direct to carbonic acid gives 800 units of heat.

From these facts it will be seen that great care should be exercised in the Seamen gas steel melting furnaces, that no more combustion be allowed to take place in the producers, than barely sufficient to vaporize the coal, so as to transmit as large an amount of free carbon (smoke) to the melting chambers as possible, thus economizing the large amount of heat developed in the production of carbonic oxide gas as far as possible. ATOM.

July 28, 1873.

The Suez Canal.

The *Pall Mall Gazette* says: Notwithstanding the annual meetings of the shareholders in Paris, the actual financial position and prospects of the Suez Canal have been much of mysteries hitherto—at all events to Englishmen. We know that great sums had been spent on the construction; that the original estimates had been enormously exceeded; that the cost of foreign labor employed had involved a great expenditure of life and money; and, moreover, we could fancy that the system of backshish so common in the East must have been in full operation, and that M. Lesseps's diplomatic gifts and indefatigable energy must necessarily have been backed up by heavy draughts on the expectations of his company. At last, however, these mysteries seem to be happily dissipated. The shares of the company are admitted to formal quotation on our Stock Exchange; and, thanks in especial to one or two admirably sound and lucid articles in the *Economist*, the English speculator may calculate approximately what are the chances of an investment in Suez Canal shares.

We may say at once that the company's balance sheet is more satisfactory than might have been expected, and much more satisfactory than has been generally believed. It shows that the present market price of the property is by no means excessive, according to the estimates of experts, or in consideration of the company's prospects in reference to the facts and figures placed before us. In round numbers, the works appear to have cost £19,000,000. From that sum, however, £6,000,000 has to be deducted, which was derived from other sources than the pockets of the shareholders; it came chiefly in the way of indemnity for rash concessions by the Khedive that were subsequently retracted. But in withdrawing these first concessions of extensive riverain desert, the company was still permitted to retain considerable domains round such centers of its traffic as Port Said and Ismailia. The consequence is, as the *Economist* puts it, that it is in possession of a property at £6,000,000 below cost price, as well as of very considerable stretches of soil or sand which probably may advance materially in value. The receipts for 1873—those for 1874 have not been issued—were £991,000. The expenditure amounted to £225,000. The cost of working is said to be no more than 23 per cent. From the net balance of £766,000 of profit must be deducted a sum of £469,000 appropriated to various preferential claims. But the upshot is that the company was earning in 1873 a dividend of 3¾ per cent.; that it must certainly have been improving its position in the past year; and that there can hardly fail to be a progressive advance, although there must necessarily be a variety of opinions as to the amount of it.

Looking at the position his grand project has already attained to, M. Ferdinand de Lesseps may well be proud. He had to fight a hard battle against formidable odds on a field that kept shifting under his feet like the sands of the dessert. He had to argue, to bargain, to bribe, and sometimes—as you must do when you have to carry your point with Orientals—to bully. Nothing could have enabled him to triumph over such opposition but a very rare combination of qualities. He united indomitable perserverance to considerable powers of persuasion, aided by the contagious earnestness of profound conviction. He had necessarily a good deal of the gambler's temperament, with a marvelous gift of abstraction and self control, even when the exciting game had drawn on to its climax. Those who saw him on the day the canal was opened still for the most part regarded him as a visionary and enthusiast. Rumors were general that "the game was up" after all, and his canal a failure; that at certain places it had proved impossible to keep the indispensable depth of water above the heaving mud of the bottom. It was a fact that a vessel had stuck fast, and the circumstance gave consistency to the sinister reports in circulation. Impartial strangers who were most hopeful were inclined at best to believe that but an ephemeral triumph had been achieved at an utterly disproportionate price. To all outward seeming, the confidence of M. Lesseps himself had never been shaken for a single moment. He had made a dash up the canal in the early morning to see to the stoppage. He came back serene and smiling to figure as the host in the ceremonies of the day. He took his place himself in the biggest and most awkward vessel of the whole fleet of the Messageries Imperiales; and when the whole train of ships had filed through, and when Suez had been reached with scarcely a check or detention, he expressed his conviction, with his habitual emotional confidence, that his scheme must be a grand commercial success, must work a revolution in the trade of the world.

We think it only honest to record all this, now that his sanguine expectations seem likely to be fulfilled. It is true, as the *Economist* very shrewdly pointed out, that the calculations on which he founded his estimates have been materially falsified in one respect. He looked forward to having his canal freely used by the sailing ships that hitherto had been subjected to costly delays in weathering the storms of the passage round the Cape. As it has turned out, scarcely any sailing vessels are being towed through the Isthmus, and steam has been running sails off the route. But the main fact remains, that he is diverting the Eastern trade, as he proposed to do. And in matter of engineering detail, events have marvelously confirmed his opinions and experiments, and those of his advisers. It was said the treacherous bottom of Lake Menzaleh was likely to present insuperable difficulties. So far as we can learn, that part of the passage has presented in practice no difficulties at all. It was said the banks of incohesive sand must crumble in places to the mere motion of the screws or paddles of passing steamers. It would appear that the banks have not crumbled, nor has the channel been filled up seriously, even where the surface of the desert is loosest and most drifting. The silting at the terminal harbors, especially at Port Said, from the Nile drift, has been counteracted by dredging. There are extra expenses awaiting the company, no doubt; but they arise, for the most part, out of its success. Passing places must be multiplied, and, not improbably, it may come to be needful to widen the canal throughout its whole length. Profits beyond a certain point will be partially neutralized by the stipulation that insists upon charges being modified should the traffic increase in a certain ratio. But even adopting the *Economist's* moderate estimate of a probable annual increment in the net profits of 5 per cent., the ultimate success of the company seems insured.

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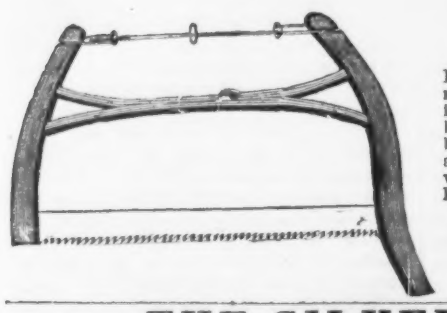

Elliptic Forked Saw Frame.

Patented June 28th, 1870.

The annexed engraving represents my ELLIPTIC FORKED SAW FRAME, which commends itself to the trade for its simplicity of construction. The Forked Brace being all in one piece, without any center bolt, secures for the Frame great strength and durability. These Frames are put up with my best Webs, marked "No. 40, Harvey W. Peace."

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Sole Proprietor & Manufacturer,
VULCAN SAW WORKS.
WILLIAMSBURGH, N. Y.

THE SILVER STEEL DIAMOND CROSS-CUT SAW.

$1.50 Per Foot.

Patent Secured

PATENT HANDLES AND GAUGE INCLUDED.

THIS new Saw, which is destined to take the place of all Cross-cut Saws in point of **SPEED AND EASE**, is manufactured by **E. C. ATKINS & CO., Indianapolis, Ind.**, who are the

SOLE MANUFACTURERS FOR THE UNITED STATES.

So confident are we that this is the best Cross-cut Saw in the market that we CHALLENGE THE WORLD. Orders promptly filled.

E. C. ATKINS. H. KNIPPENBERG.

E. C. ATKINS & CO.
Saw Manufacturers and Repairers, Indianapolis, Ind.

Lloyd, Supplee & Walton,

HARDWARE FACTORS.

MANUFACTURERS OF

Bonney's Hollow AUGERS.

Stearn's Hollow Augers and Saw Vises

Bonney's Spoke Trimmers

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Adjustable Gate Hinges

Scandinavian Pad Locks

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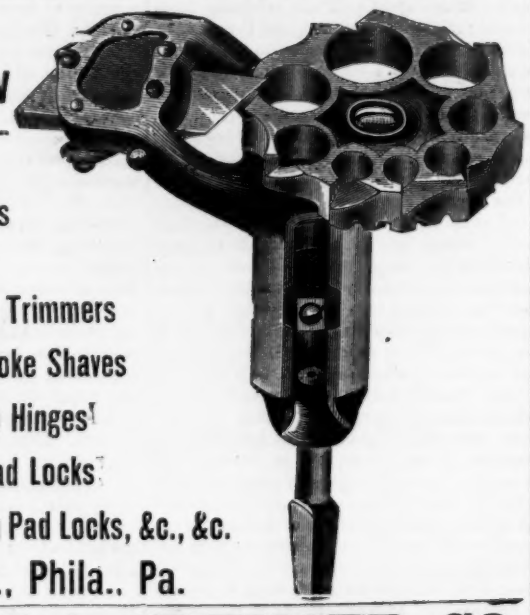


625 Market St., Phila., Pa.

BILLINGS & SPENCER CO.

MANUFACTURERS OF

CLAMP, DIE AND COMMON

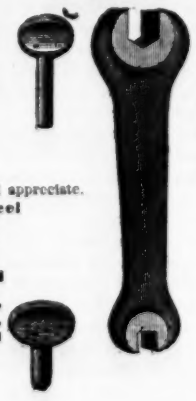
LATHE DOGS.

Vienna, 1873.

Forged from Bar Steel And Hardened

Under Billing's Patent Process.

For Progress.



FIRST CLASS ARTICLES,

and something that every machinist and Tool Maker will appreciate.
Also, all Descriptions of **Wrought Iron & Steel**

DROP FORGINGS.

For Machine Handles, Lathe Wrenches, Spinning Rings, Marlin Spikes, Clinch Rings, Thumb Screws, Thumb Nuts, and Parts of Drill Chucks, Sewing Machines, Guns, Pistols, and

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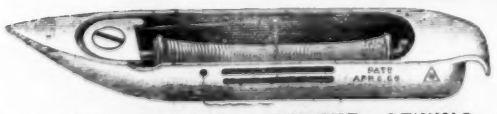

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THE BILLINGS PATENT SEWING MACHINE SHUTTLE,

Thirty Varieties now made, Forged Solid from Bar Steel and Cold Pressed. Also,

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Patent Self-Adjusting PIPE WRENCHES, of all sizes.

Illustrated Circulars and Price List sent to any order on request.

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E. M. Boynton,

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Manufacturer of

Saws of all kinds.

Also Sole Manufacturer of

LIGHTNING SAWS.

Two Direct Cutting Edges, instead of one Scraping point.

Note extra steel and durability over the old **V**, outlined on **M** tooth.

Telegram Dated Oct. 1st, 1874.

STATE FAIR, EASTON, PA.

To HENRY DISSTON & SONS:

Philadelphia, Pa.

I want you to publicly test that challenge on Cross Cut Saws. Name time and place within thirty days. American Institute preferred. E. M. BOYNTON.

E. M. Boynton gave on Wednesday of last week an exhibition of what his Lightning Saw could do at the Pennsylvania State Fair, in which two men sawed through a sound oak log, 16 inches in diameter, in 17 seconds. Mr. Boynton informs us that his export trade is increasing, he having lately made large shipments of his saws to Australia and other distant markets.—*The Iron Age*, Oct. 8, 1874.

For fuller report of this exhibition see the *Easton Morning Dispatch* of Oct. 1st, 1874.

Henry Disston & Sons cannot furnish Lightning Saws. Why do they imitate mine?

J. FLINT,

Manufacturer of

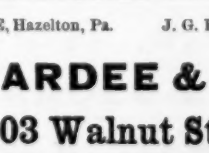
ALL KINDS OF

SAWS

And Plastering Trowels,

ROCHESTER, N. Y.

A large Stock of **Cross Cut Saws** constantly on hand. Orders filled promptly. **Dietrich's Double Handle One Man Cross Cut Saw** made with any kind of tooth desired. Our patent method of grinding Hand Saws makes them superior to any in the market. Send for Illustrated Price List.



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FORGED

HORSE SHOE NAILS.

Manufactured from the best of **NORWAY** Iron, and warranted to give entire satisfaction.

S. S. PUTNAM & CO.,
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Rogers' Self-Sharpening HOE.

The best Hoe in market. It will not batter or break. Wears itself sharp. Will last twice as long as any other Hoe, and is warranted to cut the "Bolles Hoe" or any Hoe in market.

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BYRNE & FITZSIMONS, - - - - Albany, N. Y.
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A. PARDEE & CO.,

303 Walnut St.,

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The following superior and well-known Lehigh Coals are mined by ourselves, and firms connected with us, viz.

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Manufacturers of Warranted Cast Steel

SAWS

of every description, including

Circular, Shingle, Cross Cut, Mill, Hand, Roberts' and other Wood Saws,

&c., &c

Cast Steel Files

of the well known brand of

Wheeler, Madden & Clemson.

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Manufactured from

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make a specialty of the LARGEST SIZES of **Circular Saws**, and call particular attention of lumber manufacturers to the following points of excellence:

Evenness of Temper.—The peculiar structure of my furnace subjects all parts of the saw to a DEAD heat, and when dipped in the oil bath secures perfect uniformity.

Perfect Accuracy in Thickness.—My saws are ground on a patent machine, automatic in its operation, grinding off the thick places upon the plate before the thinner parts are reached, and when the saw is removed BALANCES PERFECTLY, which is proof positive of the right accomplishment of the work.

Properly Hammered.—Great care is taken that no saw shall leave my works without due attention in this important particular. A saw too tightly strained upon the rim, or too loose in the center, cannot be successfully run—hence the importance of so hammering the saw as to effect equal strain in all its parts, and at the same time RUN TRUE. This department is under the personal supervision of myself, who has devoted over *twenty years* to the art of saw making.

I am sole proprietor and manufacturer of the celebrated **"Challenge" Cross-Cut Saw.** Price Lists of all kinds of saws sent on application.

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NORTH CAROLINA HANDLE CO.,
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Manufacturers of
AXE, PICK, GERMAN & AMERICAN SLEDGE, and other Handles.
Full assortment always on hand.

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Hardware Commission Merchants,

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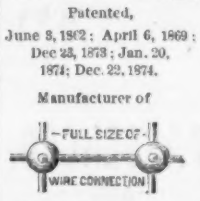
JOHN MAXHEIMER,

Patented,

June 3, 1862; April 6, 1869; Dec 23, 1873; Jan. 20, 1874; Dec. 22, 1874.

Manufacturer of



JAPANNED and PATENT EUREKA Bright Metal

BIRD CAGES.

Nos. 247 & 249 Pearl Street
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H. CARTER,

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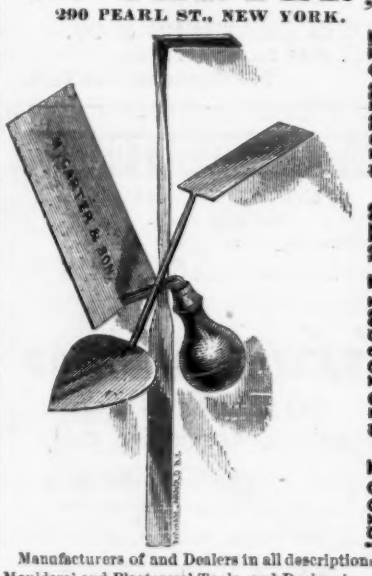
Moulders' and Plasterers' Tools.



Manufacturers of and Dealers in all descriptions of Moulders' and Plasterers' Tools, and Dealers in General Hardware, Gilded Copper Weather Vanes.

CARTERS' PATENT CARRIAGE LIFTING JACK, &c

Backus's Patent Bit Brace

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Angular Extension BORER.

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SOLE MANUFACTURER OF

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This tool can be used in any brace, at any angle, and also for straight work. Is the best and most convenient tool of its kind ever offered to the public. Eight thousand sold the first year.

Also Manufactures the Straight Extension

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The socket is arranged so that the strain does not come on the jaws, but on the square hole which fits the shank of the bit. The jaws attached to the sleeve hold the bit firmly in the square, and center it truly. The sweep is of wrought iron. The general finish of the stock is good. Its appearance is neat. Mechanics who have used it unanimously pronounce it superior to all others; and we offer it to the trade as the strongest, most simple, and quickest operating brace in the market. We manufacture five sizes. The number of inches of sweep corresponds with the commercial number of the bit.

Cutlery.

John Russell Cutlery Co.,

FACTORIES AND OFFICE,

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Manufacturers of

TABLE CUTLERY,

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IN GREAT VARIETY

Extra Hard Rubber Handle Table Cutlery of our own Manufacture.

Fine Ivoride Handle Table Cutlery, very White and Durable.

Sample Office, 77 Chambers St., N. Y.

NORTHAMPTON CUTLERY CO.,

Manufacturers of all kinds of

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Cook, Butcher, Shoe and Hunting Knives. Sole Agents for Rogers' Cutlery Co.

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MANUFACTURERS OF

Pen and Pocket Cutlery, Solid Steel Scissors, F. & L. Shears, Razors, Russia Leather Strops, Oil and Water Hones, &c.

Sole Proprietors of the renowned full concaved patent

"ELECTRIC RAZORS."

Also Agents for the BENGALL RAZORS.

American Table Cutlery, Butcher Knives, &c.

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TABLE KNIVES AND FORKS OF ALL KINDS,

AND EXCLUSIVE MAKERS OF

And the "Patent Ivory" or Celluloid Knife. These Handles never get loose, are not affected by hot water, and are the most durable knives known. Always call for the Trade Mark "MERIDEN CUTLERY COMPANY" on the blade. Warranted and sold by all dealers in Cutlery, and by the MERIDEN CUTLERY CO., 49 Chambers Street, New York.

THE MILLER BROTHERS CUTLERY CO.,

Manufacturers of

PATENT FINE PEN & POCKET CUTLERY

WEST MERIDEN, CONN.

The **only Knives made** that are put together in such a manner that there is no strain on the covering or frail part of the knife. We warrant our knives equal in cutting qualities and workmanship to any made, and are acknowledged by English makers as the **Best American Knife.** We also make

NICKEL & SILVER PLATED POCKET KNIVES

which will not rust or become discolored when used as a Fruit Knife, and their cutting qualities are equal to any other knife. Orders filled from the factory or by

J. CLARK WILSON & CO., 81 Beekman Street, N. Y.

BUCK BROTHERS, Millbury, Mass.

The most complete assortment in the U. S. of **Shank, Socket Firmer, and Socket Framing Chisels.**

PLANE IRONS.

Gouges of all lengths, and circles beveled inside or outside. Nail Sets, Scratch and Belt Awls, Chisel Handles of all kinds. Orders filled promptly; generally same day as received.

ROGERS & BRO.,

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Celebrated Silver Plated Goods,

FORKS, SPOONS, HOLLOWWARE, &c.,

STAMPED

"ROGERS & BRO. A 1,"

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Price Lists and Discounts mailed on receipt of business card or reference. Address

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ESTABLISHED 1838.

NEW YORK KNIFE CO.

MANUFACTURERS OF SUPERIOR

Table & Pocket Cutlery,

WARRANTED TO BE MADE OF THE BEST MATERIAL

WALKILL RIVER WORKS,

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THOS. J. BRADLEY, President.

AMERICAN PEN AND POCKET KNIVES,

MANUFACTURED BY AB PEPPERELL, MASSACHUSETTS

Aaren Burkinshaw.

My Blades are forged from the best Cast Steel, and warranted. To me was awarded the GOLD MEDAL of the Connecticut State Agricultural Society; also a Medal and Diploma from the Mass Mechanics' Ass'n Sept., 1860

Wood's Hot Water-Proof Table Cutlery.

Handsomest, Cheapest, most Durable Cutlery in use.

Wood's Celebrated Shoe Knives. Butcher Knives a specialty.

WOODS CUTLERY CO., Antrim, N. H.

CLARK WILSON & CO., Agents 81 Beekman St. N. Y.

Send for circular and price list, of the best selling Pruner IN THE WORLD. Being sole manufacturers we offer special inducements to dealers and agents. Receives first premiums wherever shown for competition.

4 foot pole,.... $2.50
6 " " 2.75
8 " " 3.00

Samples C. O. D. or on receipt of price.

Cutlery.

KING, BRIGGS & CO.
80 CHAMBERS ST. NEW YORK
ENGLISH
HARDWARE.
WOSTENHOLM'S
IXL
POCKET KNIVES,
KNIVES & FORKS,
RAZORS,
SCISSORS, FILES, CHAINS
ANVILS, VISES
GUNS.

JOSEPH S. FISHER,

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AGENT FOR

George Wostenholm & Son,

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Celebrated I-XL Cutlery, Razors, &c

AGENT FOR

WALTER SPENCER & CO.,

Steel and File Manufacturers.

[Rotherham, ENGLAND]

Corporate Mark.

SPENCER ROTHERHAM

Granted 1777

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Hardware & Cutlery,

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CELEBRATED CUTLERY,

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CHARLES PEACE, Jr., Agent.

The demand for **Joseph Rodgers & Sons'** productions having considerably increased, they have, in order to meet it, greatly extended their Manufacturing Premises and Steam wer.

To distinguish Articles of **Joseph Rodgers & Sons'** Manufacture, please to see that they bear their Corporate Mark.

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CUTLERY AND RAZORS,

Washington Works, Sheffield.

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FREDERICK WARD & CO., Sheffield,

Cutlery and Table Knives.

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ROMER & CO.,

Established 1837.

Manufacturers of **Patent Brass Pad Locks for Railroads and Switches. Also, Patent Stationary R. R. Car Door Locks. Patent Plan and Sewing Machine Locks.**

141 to 145 Railroad Avenue, NEWARK N.J.

Illustrated Catalogues sent on application.

PATENT AUTOMATIC DOG MUZZLE.

We would call the attention of jobbers to the necessity of sending orders early in the season for the

Automatic Muzzle,

which must supersede all others. It has the endorsement of Mr. Bergh, and is one of the best and most humane inventions of the age.

Manufactured by W. T. & J. MERSEREAU,

62 Duane Street, N. Y.

Established in 1836.

Shelton Company,

Manufacturers of every variety of

TACKS & SMALL NAILS,

Carriage, Machine, Plow, Stove and Tire Bolts, Coach Screws, Bed Screws, &c.

BIRMINGHAM, CONN.

PHILADELPHIA CORRESPONDENCE.

PHILADELPHIA, April 19, 1875

The news that *Pittsburgh had surrendered* was received in this city with somewhat varied feelings in iron circles last week. By some in the trade it is considered as indicative of a decided improvement in the pig iron market by creating a lively demand for forge pig, and thus, a market for such furnaces as have or may get coal. To others, and the majority, perhaps, it is a cause of deep regret, and especially at a time when the example offered by the yielding manufacturers to other striking operatives will be simply to strengthen them in their demands, and to practically extend aid and encouragement to labor union contests. In an immense manufacturing city like Pittsburgh, however, it is a matter of the greatest difficulty to maintain any unity of action among so many competing mills as are there represented. The firm which is said to have broken the lock-out does an enormous business in certain lines of rolled iron, and could not with equanimity see its trade slipping into other hands. Quite as likely as not, however, may be the assertion that the action of this firm was only taken upon the decision of all interested. Be this as it may, the one undeniable fact exists that the union has beaten the mill owners in the best chance they ever had to destroy it, root and branch, and that henceforth Pittsburgh puddlers can do pretty much as they please in that iron consuming city. This action will not tend to decrease the troubles in the coal regions or to strengthen manufacturers elsewhere in their efforts against the steadily increasing tendency to agrarianism and lawlessness on the part of the working classes. But as it is so, mote it be. From the anthracite region there is nothing new. The troops are still retained at Hazelton, and while present there is little or no danger of any outrages. A new feature appears, however, in the case, and this from among our citizen soldiery called to the coal front. Those merchants, bankers and others whose clerks compose the flower of our chivalry are complaining that they cannot and will not much longer abide their absence or the inconvenience and loss occasioned by it, and threaten on their part a strike against the authorities which so suddenly deprived their counting houses and shops of the volunteers. The situation is an unpleasant one for the mercantile soldier, and it is either a choice between losing his position and occupation as a commercial man or retaining his rank and status as a military conservator of the public peace. Perhaps, under this aspect of affairs, the Coal and Iron Company and its confreres may follow the example of Pittsburgh, and another triumph be registered for trade unionism! Last in the interminable list of strikers come the bituminous coal miners of the Clearfield district, against whom a regiment of special police has been recruited in this city on private account and shipped West. The subject is, however, at best a nauseous one, and we turn to more profitable gossip.

Far more important to the American iron master is the recent appointment by the Secretary of War, of the Board of Officers to supervise the tests of American iron and steel to be conducted at the Watertown Arsenal. The officers are all well known engineers, and the civilians comprise such well known names as Prof. Thurston, W. Levy Smith, C. E., and A. L. Holley, C. E. It is officially stated that the contract for the testing machines to be used will be, or have been, given to the firm of Riehle & Brother, of this city. The value of these experiments cannot be overlooked, and in the future we shall have some reliable data for standards of strength in our own products.

The success of the last Franklin Institute Exhibition suggested the idea of a permanent Institute of Technology here, and the project has since assumed practical shape. The plan proposes a building containing a museum, laboratory, machinery, philosophical apparatus and three lecture rooms on the ground floor, the principal lecture room to be 110x130 feet, and capable of holding 1500 persons. Two smaller lecture rooms, 60x80 feet, will be used for lectures on chemistry and natural philosophy. The second floor will be used for library, offices and class rooms, and the third by archives, drawing and model rooms, and mineralogical cabinets. The museum is to be 130 feet square, extending open to the hight of the dome with three rows of galleries. It is proposed during the centennial year to have scientific lectures in the various languages delivered by native and foreign savants. The cost of the building is estimated at $388,000, and it will be located at the corner of Thirteenth and Market streets, the site of the last Franklin Institute Exhibition, and it is proposed to commence the construc- at once. There can be no question as to the value of such an institute to this city, and as it is in good hands the project will doubtless succeed.

A new and practical invention, likely to be of great life-saving service, is a device for safely lowering boats in a seaway, and which was tried at the Navy Yard during the week. The plan is simplicity itself, and consists of a thin wire rope with looped ends which is rove through the ring-bolts of a life-boat, fore and aft. The outer loops at bow and stern engage the hooks of the davit tackles, while the inner loops meet at the centre of the boat and are joined with an ordinary lanyard lashing. The boat, filled with passengers, is lowered to the surface of the water, when the center lashing being cut both bow and stern strands are simultaneously detached, preventing the very common occurrence of swamping the boat by one tackle being released in advance of the other.

The commission to appraise and sell the present navy yard grounds, etc., in this city, and apply the proceeds to the League Island yard, consisting of the Secretaries of the Navy and Treasury, Gen'l Humphreys and Mr. Thos. Cochran, of this city, has been organized and has met at Washington. The ground is estimated to be worth over $2,000,000, which, or whatever it may bring, is to be used solely for the improvement of League Island as a naval station. Hence there is a strong probability of some prompt action with the new yard.

A new work, likely to create not only considerable discussion, but marked attention, has just appeared from the pen of Prof. R. E. Thompson, Professor of Social Science and Natural Economy, at the University of Pennsylvania. It is said to strongly advocate the principles of the protective system, to show marked learning and ability in the treatment of the topic, and to furnish a very readable discussion of a subject which few even of those most strongly interested in it pretend to thoroughly understand. As a text book it will be valuable, and we shall hope to refer to it, as it deserves, more at length hereafter.

Bessemer Ores.

LABORATORY, 113 WALNUT STREET,
PHILADELPHIA, March 29, 1875.

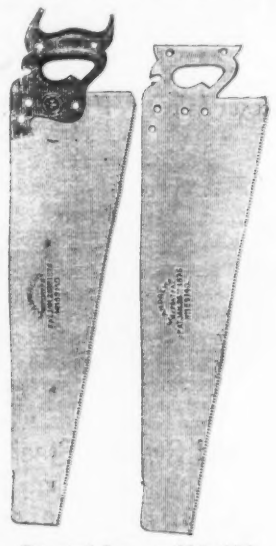
To the Editor of The Iron Age—DEAR SIR: The subject of iron ores free, or nearly so, of phosphorus and sulphur is, as is well known to those interested in iron, attracting a great deal of interest in this country, for use in the Bessemer and Siemens-Martin process. Having lately seen in your valuable journal the analysis of a number of such ores from Virginia, we have thought it might be of interest to you to know the result of an analysis we have lately made for parties owning lands in the vicinity of Lynchburg, Va. Part of this land has already been prospected, and our analysis was made on a large sample of the outcrop. You will notice that it is remarkably free from phosphorus.

Metallic Iron	52·83
Sulphur	·015
Phosphorus	·001
Titanium	none

We remain yours, truly,

WALLACE & HUMPHREY.

E. Andrews, Williamsport, Pa., has placed on the market his newly patented hand saws, which are illustrated in the annexed cut. The saw blade being extended through the handle to that point held by the hand, he claims: "By thus embedding the saw blade in the handle, all the weak parts of the wood are protected against breakage from an accidental blow or fall; and the two additional screws through the part held by the hand, prevents the handle from getting loose." The loosening of hand saw handles has always been a source of annoyance and expense to the user of saws, and this improvement in construction, while imparting strength and firmness to the handle, does not in the slightest degree mar its symmetry or alter its general appearance.



Patented January 26th, 1875.

Preventing Boiler Incrustations.

The number of substances that have been invented and used for preventing the formation of those dreaded incrustations is so great that we doubt if any one person can remember half of them. A substance said to be employed with much success in Germany, is a compound of tannin with glue or gelatine. It is prepared by boiling leather scraps and cuttings in water, and pouring the dilute and impure glue water thus obtained into a boiling solution of tannin. The tannate of glue is precipitated in brownish red flakes, which collect together on being boiled, and finally sink to the bottom, as a coherent mass, which is soft and elastic when warm, but hard and brittle when cold. A sample prepared by mixing ordinary glue with a decoction of oak bark was almost perfectly insoluble, but on boiling, the sides of the vessel become almost completely covered with the softened mass. It is this property that prevents the deposition of a crystalline incrustation. The preparation, which is made by Praeger, sells for 10 thalers per cwt. in Leipsic, and is highly recommended.

Mohr, in an address before a society at Mannheim, spoke very favorably of the results of employing glycerine for the same purpose, as it not only prevented the formation of these troublesome deposits, but also removed them when already formed. The mineral matters are precipitated, in the presence of glycerine, as a fine powder which is easily removed. The quantity required for a boiler with 160 square feet of heating surface is 20 lbs. every fortnight. At the same meeting Mr. Lehzen stated that glycerine was only useful in water containing carbonate of lime, while in water containing the sulphate it exerted no beneficial effect. Elsaessuer thought that the fact of its dissolving old incrustations was a sufficient recommendation. The president, Mr. R. Schmidt, stated that Burfitt's composition really did prevent the formation of incrustation, but caused the formation of a large quantity of slime and impurities which stopped up all the cocks and pipes. He considered de Haen's method the best of any yet introduced. This method, it will be remembered, consists in precipitating the bicarbonate of lime from the water by means of caustic lime, and the sulphate of lime by chloride of barium, both at one operation. If a slight excess of lime is employed the sulphate of baryta and carbonate of lime settle so rapidly that the clarified water can be drawn off after the lapse of 15 minutes.

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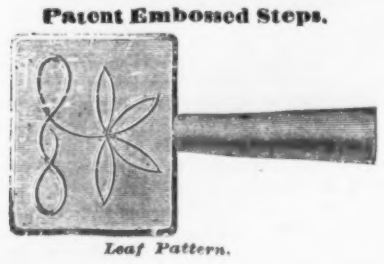
Patent Embossed Steps.

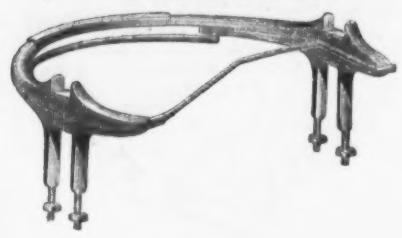


Leaf Pattern.

King Bolt Yokes.

Established 1850.

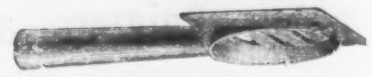
No. 6 Fifth Wheels.



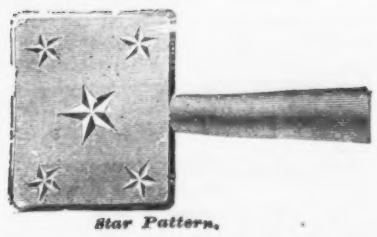
1871 Pattern Shaft Couplings.

Patent Cross Bar Steps.

Upper View.



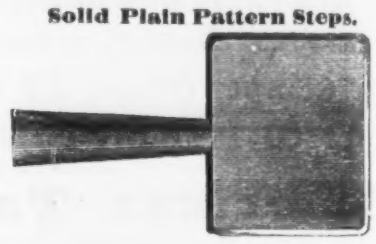
Lower View.



Star Pattern.

Smith's Improved Philadelphia Pattern Slat Irons.

Solid Plain Pattern Steps.



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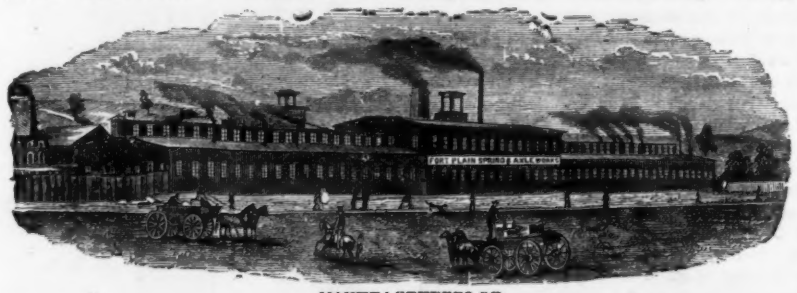

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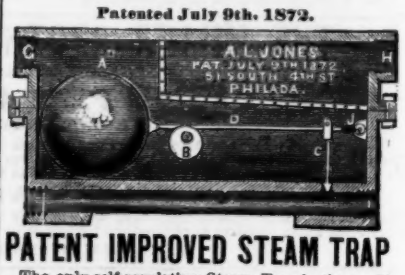

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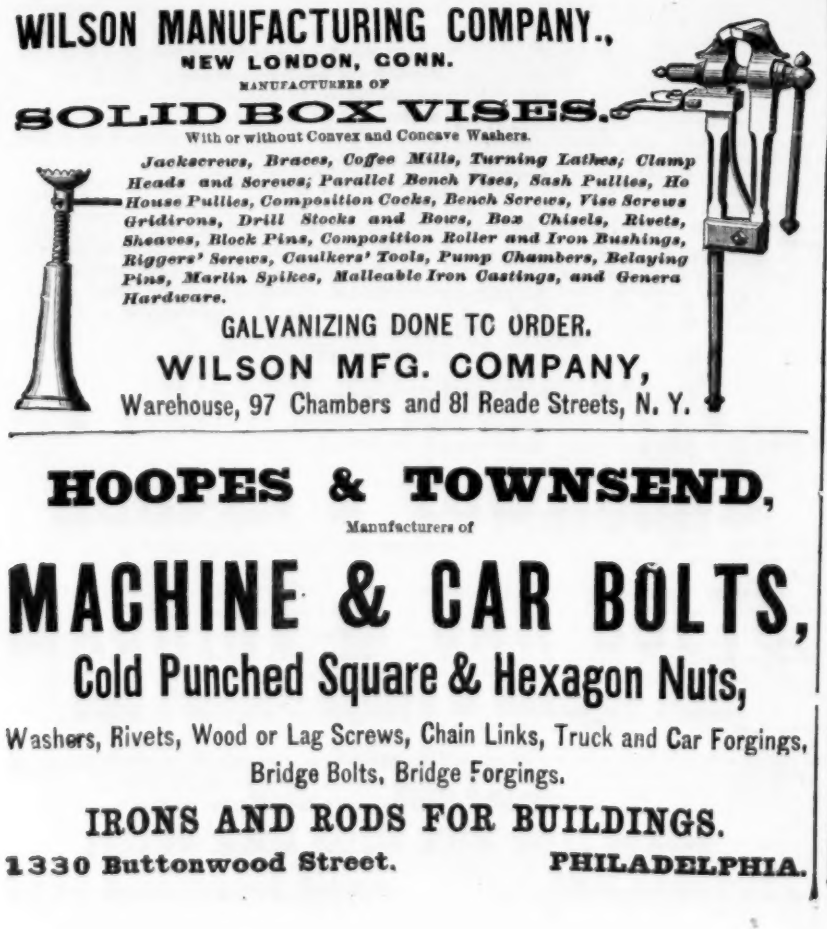

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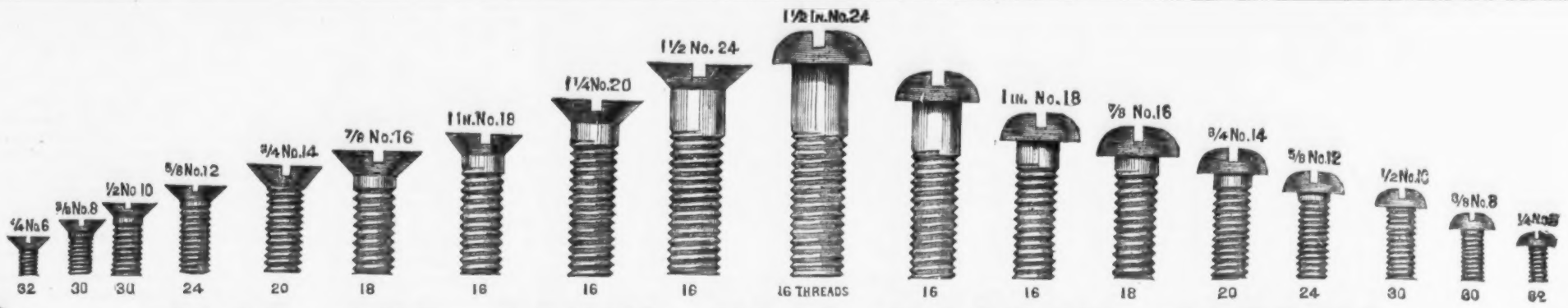

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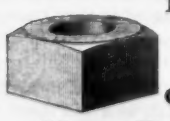

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and

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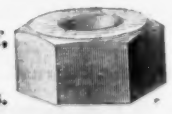

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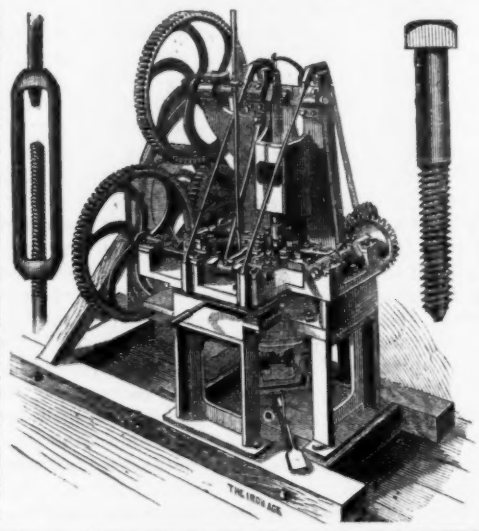

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New York, Thursday, April 22, 1875.

DAVID WILLIAMS - *Publisher and Proprietor.*
JAMES C. BAYLES - *Editor.*
JOHN S. KING - - *Business Manager.*

NEW YORK, January 2, 1875.

Until the 1st instant the postage on newspapers was paid by subscribers at the office where the paper was received, the yearly rates on the different editions of *The Iron Age* being as follows: Weekly, 40 cents; Semi-Monthly, 40 cents; Monthly, 24 cents.

Under the provisions of the new postal law, which went into effect on the 1st instant, prepayment at the office of mailing is required, at the rate of two cents per pound for the Weekly, and three cents per pound for the Semi-Monthly and Monthly, which will make the postage as follows on the different editions: Weekly, 50 cents; Semi-Mouthly, 30 cents; Monthly, 15 cents.

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City Subscribers will confer a favor upon the Publisher, by reporting at this office any delinquency on the part of carriers in delivering *The Iron Age*: also, the loss of any papers for which the carriers are responsible. Our carriers are instructed to deliver papers only to persons authorized to receive them, and not to throw them in hall ways or upon stairs; and it is our desire and intention to enforce this rule in every instance.

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End of the Pittsburgh Lock-out.

As our edition of last week was going to press, the intelligence reached us by telegram from Pittsburgh, that the great lock-out of the boilers had ended by a surrender of the employers and the resumption of work on the basis of $5·50 per ton. The boilers are naturally elated, although they do not consider that they have lost during the long season of idleness more than they can make up during many months of continuous industry. The successful strike will do more to strengthen the influence and power of the union and to maintain wages on an artificial basis.

As we said last week, the result of this great contest is to be deplored. We understand perfectly well that the mill owners of Pittsburgh and vicinity conduct their business in accordance with what they believe to be their best interests. We know that they have already made great sacrifices in defense of their right to manage their own business, and that the Eastern mills have enjoyed the advantage of larger orders because of the suspension of the mills of the West. It is natural, therefore, that the employers of the West should desire to bring about an adjustment of the dispute between themselves and their men at the earliest moment, and if they saw fit to give up the contest now and lose the benefit of all the sacrifices they have made up to this time, they have a perfect right to do so. At the same time, we doubt the wisdom of the policy they have seen fit to adopt. The question at issue was not wholly one of wages. The employers found that it was a struggle to determine whether they or the men should control in matters involving a difference of opinion, and from a strike it developed into a lock-out, the masters and men, to some extent, changing places. If the question was worth contesting at all, it should have been contested to the bitter end. To give up the struggle, now that the best part of the spring trade is over, and with no assurance of an active demand for iron manufactures, is to render more than useless all the sacrifices thus far made and all the losses thus far borne. To have forced the men to abandon their position would have been a substantial triumph of right over wrong—of principle over organized and unreasoning selfishness. To surrender to the union under the circumstances means to confess that capital cannot defend itself against the labor unions, and to encourage the latter to push the advantage they have gained until capital can no longer meet their demands. As we said before, we have no right to find fault with the Western mill owners for doing what they believed to be for their own best interests; but we think it to be regretted that they have thought it to their interest to surrender to the union after wasting so much time and money in a useless lock-out. Up to this time they have had but little experience of this kind of trouble. Their policy toward the union had been one of compromise and conciliation, and they have extended to employers in other sections but little help in resisting its encroachments or contesting its unreasonable demands. They will now have an opportunity to see whether, after all, the union is so desirable and commendable an institution as they have hitherto affected to consider it. They have encouraged its formation and development until it has become a formidable power, and until employers shall organize with honest purpose for mutual protection, the puddlers will be in a position to dictate whatever terms and conditions they may see fit. The prospect is not a pleasant one for the employers.

The Cost of Car Wheel Irons.

In a recent article on Car Wheel Irons for Export, we quoted from some very excellent authorities of various estimates of cost in different sections of the country, and upon these based the assertion that, admitting the truth of such estimates, Charcoal Pig Irons could be exported at a fair profit to the manufacturer. This statement was, as distinctly stated at the time, made only in reference to the product of such Furnaces as from their location could command water freights to the seaboard. Probably there is no more dangerous topic for a trade journalist to approach than that of the cost of producing any grade of iron. It is a matter which varies so much under different conditions of locality, management, character of ore and its cost, whether through purchase or actual ownership and development, that the statements made on the authority of the most experienced manufacturer of a given region will be frequently scouted as unfair by another, and almost assuredly so by those of a different section of the country. Moreover, it has frequently occurred that interested parties, who fear competition, have so far stultified themselves as to represent the cost of their product beyond what it should really be charged with as an actual element of expense. In view of the great depression attending the production of Charcoal Iron in the United States, and the close attention now being paid in England to American Car Wheels made from such irons, we believe it to be very desirable that an export trade for this product should be obtained, if it can be done. From the information we have secured, we think this in certain cases to be true, and have so stated. With this explanation we give place cheerfully to the main points in opposition to our statements, as lately received from a correspondent in Virginia whom, from his apparent familiarity with the subject, we presume to be a Charcoal Iron manufacturer. Premising that no design is attributable to our statements of what iron could be sold for, that it should be sold for "even less than the present ruinously low prices," or of "enticing capital which will fail to realize the return which, from the figures given it will be led to expect," we proceed to give the assertions of our correspondent and our comments on the same.

He says:

"*First.* That no cold or warm blast car "wheel iron manufacturer in the South or "Southwest can afford to sell his product "delivered at the nearest transportation for "less than $30 per ton, and that the ma- "jority of them cannot afford to sell for "less than $35 per ton at the same point, "if they make a first quality of iron."

"*Second.* Thar no cold blast furnace in "this section makes iron on 160 bushels, "of 2688 cubic inches, to the ton, and that "no warm blast furnace makes iron on less "than 125 bushels of the same size, if they "take the average of an entire blast and "count in the waste in handling their coal."

"*Third.* That no furnace in this section "makes car wheel iron on two tons of ore "to the ton of iron, if they take the "weight of their ore as paid for."

The above we understand to refer to the South and Southwest.

"*Fourth.* That at no location in Virginia "can charcoal be had at 4 cents or 5 cents "per bushel in proximity to fine ores, lime- "stone and water transportation." "In "explanation of these assertions allow me "to say, first, in regard to the cost of iron "at the works: You give cash in Stewart "county, Tenn. at $26·87 for cold blast "iron. I, of course, do not know how "that cost was arrived at, but, from the "figures, will venture to say, that the "amount of coal consumed does not in- "clude the amount used in heating up or "blowing out, nor any allowance for waste; "that the amount of ore per ton of iron is "the ore as weighed in to the furnace and "not as weighed out at the mine, "and so far as I can see there "is no allowance for cost of hearth "and lining, repairs, wear and tear "of machinery tools, etc. These lat- "ter items do not count up rapidly in a "large furnace making thousands of tons "per annum, but they do in a small char- "coal furnace whose product is numbered "by hundreds and not thousands of tons."

* * * * *

"The ground of my second assertion is "that in almost all the charcoal furnaces "which I have ever visisted, there is no "allowance for wastage in the handling of "coal, which, if stocked at all, amounts to "fully 10 per cent., and because few of "the furnace men can tell you what the "size of their bushel is, so that 160 bushels "of coal in this region is an exceedingly "indefinite quantity."

These are the main points made by our correspondent, and we have given them, and his grounds for his statements, which, we are happy to add, are honestly and well put. In reply, we will say that, as to the cost of cold blast charcoal iron in Stewart county, Tenn., stated at $27·87, our authority is taken from the actual report from the books of a furnace in 1873, as published by J. B. Killebrew, secretary to the State Bureau of Agriculture, in the work entitled Resources of Tennessee, page 240, which work was issued in the spring of 1874, under a State appropriation. That the items of wear and tear, cost of hearth and lining, etc., are not unaccounted for, or likely to be so, although in this case omitted, we quote from the same work on the preceding page the details of a *bona fide* transcript from the books of a company in the same portion of Tennessee, engaged in the manufacture of hot blast iron, viz.:

Number cords of wood chopped	16,176
Bushels charcoal used	643,400
Number tons of iron made	4,10
Number of days blowing	296
Average tons per day for 296 days	13,617
Number tons of ore received	10,908
Average cost of ore per ton	$2·00
Number tons of ore to ton of pig iron	2½
Number bushels of coal used	639,400
Number bushels of coal to ton of pig iron	155⅝
Average cost of coal per bushel	7¾c.
Number lbs. of limestone to ton of pig iron	612
Cost of limestone to ton	50c.
Whole amount of daily labor and salaries for the year	$26,469·49
Average cost of ton of iron for labor and salaries	6·44
Extra per ton for hearths, sand, interest, etc., etc.	1·83

From this statement it is easy to sum up the cost of a ton of pig iron thus:

155 bushels of coal at 7¾c.	$12·04
2½ tons ore at $2	4·66
Labor and salary	6·44
Lime	·50
Incidentals	1·83
Total cost of one ton hot blast iron	$24·97

While the amount of charcoal here used is in excess of the amount quoted by us, we are also assured by practical iron masters that it is very much in excess of what is absolutely required under good management. In Missouri we learn of several charcoal furnaces running on an average of 100 to 110 bushels to the ton of iron, and years ago in this State 120 bushels was considered the outside requirement in the use of fuel. In Michigan, also, the Jackson furnaces reported for the year closing Nov. 30, 1872, as follows:

Iron made	tons, 10,090 1820-2240
Ores used	tons, 15,643 1110-2240
Coal used	bushels, 1,126,771
Yield of Ore	per cent., 64·56
Coal, per ton of Iron	bushels, 111·66

Relative to the statement of our correspondent that no furnace in Virginia can make car wheel iron on two tons of ore, we have not the figures at hand from which to prove or disprove the same, but would simply say that from the very numerous analyses of extremely rich ores we have received from various parts of Virginia, and possibly from the very region in which our correspondent is operating, it must manifestly be from bad management rather than the fault of the ore, if such be the case. If, however, this statement be intended to apply to the Southwest, it is clearly erroneous, since we are credibly informed of furnaces in Tennessee which have, with the exception of the time they were idle during the war, been running for over thirty years on the same ore, and never using over two tons of ore to the ton of iron, their product having been an especially favorite car wheel iron.

Referring again to the matter of cost, and which we only do as a means of bringing out information which may be of real value to the whole country, we quote from a report furnished us by an iron master of thirty years' experience in the Southwest, the actual cost of a year's product of a 4500 ton cold blast charcoal furnace. It is to be noted that, with the view of covering all waste in handling and stocking coal, he has greatly exceeded his usual requirement of coal, viz., to 190 bushels. This report is, however, strictly authoritative in every sense:

Itemized Cost and Quantity of Material of 1 ton Cold Blast Charcoal Car Wheel Iron at Furnace.

190 bushels charcoal at 5 11-16 cents per ton	$9·61
2¼ tons iron ore at $1·11 6-10 per ton	2·79
⅛ ton limestone at 96 cents per ton	48
Superintendence, office expenses, yard and furnace labor, per ton	3·25
Wear and tear, per ton	1·03
All other incidentals, per ton	3·00
Total cost of 1 ton cold blast wheel iron	$20·16

Supposing this furnace to be located on water transportation, as it is, with freight to seaboard not exceeding $5 per ton, and allowing a profit of 25 per cent. a ton over cost, and an ocean freight not to exceed $5 more per ton, we submit that this iron can be laid down in Liverpool at $35 per ton, as previously stated.

One point more. Our correspondent says charcoal cannot be had in quantity at 5 cents per bushel in proximity to fine ores, limestone and water transportation in Virginia. In reply to this we can only say that we have the very best evidence of the existence of unusually fine ores on the line of the James River Canal, between Richmond and Lynchburg, at various points, accompanied by excellent limestone, and are further informed that the ruling price at several of such points for good hard-wood charcoal, delivered to the smith shops in small quantities for their use, is now but 6 cents per bushel, while responsible parties stand ready to contract to deliver the same for a term of years for 5 cents per bushel, or even less, to furnaces. These are facts easily substantiated, and if correct would indicate that furnaces here located, and using the ores of the region, as quoted by us, and fuels at same rate, with water freights to the seaboard at Norfolk not to exceed $2 per ton, could not fail to successfully export charcoal irons to England. We have written at length on this subject, deeming it one of the first importance to the iron trade of the United States, and with the hope of obtaining reliable information from parties engaged in charcoal iron making in all sections of the country. A thorough ventilation of the usual amount of fuel used in cold and hot blast charcoal irons, the amount and average quality of ore to the ton of iron in each section, the cost of transportation to market, the duration of the average blast, etc., etc., are all topics of prime interest, both to those engaged in this industry and to the trade at large.

The Reading Railroad.

The Philadelphia *North American*, which is always somewhat too ready to take up its cudgel in defense of anything which has its location or headquarters in Philadelphia, devotes its best column in a recent issue to a general and vague denial of certain statements made in a recent issue of *The Iron Age* respecting the policy of the Reading Railroad Company. We are sorry our contemporary has not been more specific, for what we said of the Reading Railroad Company was specific enough, and if any of our statements were false there would have been little trouble experienced in getting the facts with which to contradict them squarely and authoritatively. As we said before, so we say now: the policy adopted by that company toward the iron masters depending upon it for coal, has been such as to warrant the belief that its ambition is to absorb the entire iron trade of the section of country traversed by its road. The promises made by the responsible agents of the company to the furnace owners in the Schuylkill Valley, to induce them to blow in after the panic, were broken without so much as an apology to the victims of its bad faith, and the losses incurred by those who accepted the pledges and blew in their furnaces will involve in serious financial difficulties several concerns which might have tided over a long season of idleness without falling into the sheriff's hands. It may be pleaded that the Reading Railroad Company was not able to make good its pledges. To this we reply, that its officers knew what those pledges involved, and should not have made them if there was any danger of a necessity of breaking them before those to whom they were made had opportunity to avail themselves of the benefits offered. If the Reading Company promised furnace owners to take so much of their product as they could not sell to other parties at the current market price, and to keep them supplied with coal, whatever might happen; and if, on the strength of these promises, which were distinctly made to several furnace owners whom we could name by officers of the road whom we could also name, the former resumed operations at great expense and with no expectation of selling their product to consumers, only to find that the promises were abrogated as soon as their fulfillment became burdensome, it is obvious that the Reading Railroad Company is chargeable with having perpetrated a gross injustice upon the iron masters, for which no independent newspaper should apologize. If the facts are as we have stated them upon good and sufficient authority, our strictures upon the policy of the company were justly merited.

The fact is, the iron masters of the Schuylkill district find in the Reading Railroad Company a King Stork of which they have the best possible reason to be afraid. Its policy is absorptive to an absolute degree, and if the Reading Coal and Iron Company does not succeed in getting possession of several millions of dollars worth of furnace and rolling mill property during the next year or two at a cost far below its value, by buying it in under foreclosure sales, it will not be because of a desire on the part of its management to protect the interests of those whom it may have in its power. We see by the Pennsylvania papers that Governor Hartranft has signed a bill directing an inquiry into the operations of the Reading Railroad Company and the Reading Coal and Iron Company. We hope, though without much confidence, that the inquiry will be thorough and impartial. We believe it will be found that the existence of so great a monopoly is prejudicial to the best interests of the Commonwealth, and that the definition and limitation of its powers is a duty which devolves upon the Legislature. A company which charges more for coal dumped at furnaces within forty miles of its mines than it does for the same coal delivered at the wharves of markets four hundred miles away, would be the better for a little of the Granger discipline which has lately been meted out to the railroads in certain Western States.

The efforts of the striking miners to prevent the working of the pumps at the mines, are prompted by a spirit of madness for which it is difficult to find any explanation. Stopping the pumps can only be followed by results which are well known to the miners, and which they have every reason to dread. The mines fill with water, the timbers are rotted and the coal started slipping. If these results are brought about it will be a long time before the miners can again enter the mines, even after the end of the strike, and they are thus deliberately postponing indefinitely the resumption of work and the earning of wages for the support of their families. Probably they cannot, or at least do not, reason beyond the fact that the companies will thus be put to great expense and inconvenience, and possibly they imagine that, to avoid these, they will yield to the demands of the strikers. But they do not seem to know or care what becomes of themselves or their families in consequence of the course they have seen fit to adopt. We have heard of the man who set fire to his barn to avenge himself on the rats which ate his grain, but we have seldom before seen in actual experience so conspicuous an example of this particular kind of folly. If the experiences of 1873 are repeated, many of these reckless miners will pay the penalty of their lives for this wanton outrage upon themselves and their employers. The stoppage of what is called "dead work" will make a great many dead men as soon as operations in the mines are resumed.

The Bessemer Steel Works of the Albany and Rensselaer Iron and Steel Company, at Troy, made in the month of March last 4992 224-2240 tons of ingots, which we believe is the best month's product yet obtained anywhere.

The Coal and Iron of Allegheny County, Maryland.

From an interesting little book on the mineral resources of the country, surrounding the city of Cumberland, Maryland, by C. J. Orrick, we take the following:

THE CUMBERLAND COAL FIELDS.

This now celebrated coal field lies west of the city of Cumberland, in a basin formed by the Great Savage Mountain on the northwest and the Dan's Mountain on the southeast, and running northeast and southwest from Pennsylvania State Line, through Allegheny county, into Mineral county, West Virginia. The basin is about five miles wide between the two ranges and about twenty miles long. The floor of the basin slopes from either end upward to Frostburg, where it attains its greatest altitude, from 2000 to 2100 feet above mean tide.

The southern slope of the basin is drained by George's Creek, flowing southwest from Frostburg and emptying into the Potomac River; the northern slope, by Jenning's Run, flowing northwest into Will's Creek. The aggregate depth of the coal formation here is 1100 feet, its base being the Millstone Grit. Capping the summits of Savage and Dan's mountains, it extends down their sides into the valley, where it dips below the surface.

The principal coal veins are, first, the "Big Vein," 14 feet of coal, lying 1860 feet above tide. This is the vein from which most of the coal is now mined. It underlies the surface of the valley at Frostburg and Borden Shaft; but southward, down the George's Creek, water has cut away that portion of the measure lying in the lowest part of the valley, and with it this vein (which here must have been very near the surface), leaving the higher parts only of the vein standing in the hills thus formed on either side of the water course. Second, the "Four Foot Vein," which lies about 800 feet below the "Fourteen Foot Vein." This vein is below water in the higher part of the basin; but appears about 60 feet above at Barton, and lies above the level from that point southward, down the George's Creek. This vein has been opened by the Piedmont Coal and Iron Company, and proves to be equal in quality to the Big Vein, and in the southern portion of the basin lies in such a way as to be easily mined. Lastly, the "Six Foot Vein," which lies 160 feet below the "Four Foot Vein," and is above water level in the lower part of the valley only. This vein is now successfully mined at the New Reading opening, at Western port. These two lower veins, though smaller in size than the "Big Vein," have a much greater acreage, as but little of either vein has been cut away by erosion. At present the abundant supply contained in the large vein is so easy of access and can be so cheaply mined, that these smaller veins have not received the share of attention which they eventually will. Several new openings other than those mentioned are now being made in these smaller veins, with very encouraging prospects.

The total acreage of coal land in this field is 44,132. Of this, 17,300 acres contain the large "Fourteen Foot Vein," and of course all contain the two smaller veins. Beside these, which are the working veins, there are numerous other small veins, throughout the entire depth of the coal measure; these veins are from six inches to three feet in thickness; they have never received any attention from mining companies or experts, and we are not able to say what may be their actual value in workable coal. The coal of this field is so well and favorably known by consumers and dealers generally that we deem any discussion as to its merits unnecessary. For the information, however, of any one to whom the appearance and properties of this coal is not familiar, we will say that it is a "free burning bituminous coal, containing on an average 75 per cent. of fixed carbon. It is free from injurious impurities, and with very little slate or earthy particles. At the end of this article will be found a table copied from Senate Document, No. 386, of Twenty-eighth Congress, first session, which is the report of a committee of Naval Officers and Engineers which was appointed by the United States government, to test, by actual experiment, the relative value for forge and steam generating purposes of all the different kinds of coal found in this country and in England. This committee in their report, rate Cumberland Coal (in general average) to be the best coal for steam generating purposes in the market, and superior for forge purposes, also. Under equal weights the Cumberland Coal surpasses the Anthracite, in evaporative power, by about 2·3 per cent.; under equal bulk by 1·4 per cent. It surpasses the foreign bituminous coals 20 per cent. comparing equal weights, and 26 per cent. comparing equal bulk. It is now used by manufacturers and transportation companies generally throughout the Eastern States. For coking qualities, etc., we refer the reader to the article on iron.

From 1842 to 1874 (inclusive) 26,338,681 tons of this coal have been mined and shipped. The demand is steadily increasing, and will necessitate an increase of mining and shipping facilities. Several of the coal companies now in operation have made new openings and inclines during the past summer, and are now prepared to nearly double their previous shipments the coming season. The supply is still abundant; the lower veins being almost untouched, and of the upper vein there are about 12,057 acres still uncut.

In addition to the abundant supply of this valuable mineral contained in the Cumberland Coal Basin proper, a large field of valuable coal (which closely resembles the Cumberland coal) has been recently opened in an adjoining county of Pennsylvania. This coal will be put on the cars of the Pittsburgh branch of the Baltimore & Ohio Railroad, thirty-five miles west of Cumberland. The coal of this region closely resembles the "Cumberland," being like it a bituminous rich in carbon, and quite free from injurious substances and earthy impurities. From this field the industries of Cumberland are assured of a valuable supplimental supply.

Cumberland is connected with the Cumberland Coal Field by the Cumberland & Pennsylvania Railroad, which runs from Cumberland to Piedmont, through the coal basin, and by the Eckhart Mines Branch, which runs from Cumberland to Eckhart, and other mines on the eastern edge of the coal basin.

WHOLESALE PRICES OF COAL IN CUMBERLAND MARKET.

	January, 1875.
Fine	Per ton, $1·30–35
Run of mine	" 1·60–75
Lump	" 2·75

RETAIL PRICES OF COAL IN CUMBERLAND MARKET.

Prices of Coal Delivered to all Parts of the City.

Run of mine	Per ton, $2·00
Lump	" 3·90
Fine	" 1·50

TABLE OF RELATIVE VALUES OF FOREIGN AND DOMESTIC COALS FOR STEAM GENERATING AND FORGE PURPOSES.

Compiled from Senate Doc. No. 386, 28th Congress, 1st Session.

Designation of Coal.	Per cent. of fixed Carbon.	Pounds of steam to one of coal from initial temperature.	Pounds of steam furnished by 1 cubic foot of coal.	Steam from 212° from 1 foot of combustible matter.	Reducing Power. Parts of lead from litharge by 1 part of coal.	Forge Quality. Number of links of chain cable 1⅝ inches, by 60 lbs. coal.	Total waste in ashes and clinker to 100 parts.
Beaver Meadows Anthracite	91·47	8·76	556·1	10·592	33·29	....	6·74
Peach Mountain Anthracite	89·02	8·96	545·7	10·871	33·49	....	6·97
Lackawanna Anthracite	87·74	8·56	477·7	10·764	33·58	....	8·96
Lehigh Anthr'cite	89·15	7·73	494·0	9·628	28·92	....	7·12
Lykens Vall'y Anthracite	83·84	8·43	459·6	10·783	32·60	....	15·24
Cumb. Coal, av'ge of 5 samples	75·05	8·77	530·1	11·624	33·60	20	9·94
Penn. Bituminous	74·24	8·31	472·8	11·171	31·18	14	16·36
" "	73·11	8·64	515·9	10·966	32·54	15½	11·20
Penn. Cambria Co.	69·37	8·04	486·0	10·239	31·46	....	9·75
Virginia Bitum.	53·01	7·20	448·5	9·741	29·08	14	14·83
Pittsburgh Bitum.	54 93	7·08	394·1	8·942	28·80	....	8·25
Indiana "Block" coal	38·44	6·81	348·8	7·784	26·53	11	5·12
Picton, N. S.	60·74	7·45	417·0	9·648	26·69	11	12·06
Liverpool	54·90	6·95	375·4	8·255	27·88	13	5·04
Newcastle	57·00	7·68	439·6	9·178	27·55	15	5·68
Scotch	48·21	6·14	353·8	7·719	27·00	10	10·10

IRON AND IRON ORE.

The recent rapid decline in the value of all our iron manufactures has led to the blowing out of nearly one half of the furnaces in the United States, and the partial stoppage of many mills and factories consuming their product.

Stimulated by a heavy tariff iron works have heretofore been established in localities totally unfit for the cheap production of iron; thus eventually leading the capital of the country into unremunerative channels, to the detriment of the better situated works.

It behooves our iron masters to grapple with the present difficulties, and by producing manufactured iron as cheap and cheaper than either England or the Continent, find a ready market beyond the limits of the United States.

As before intimated, the situation of the works has an important bearing upon the cost of the product, and I shall endeavor to prove by the following lines that Cumberland has the natural advantages necessary for the economical production of pig and wrought iron, and that capital only is needed to make it a successful iron center.

Cumberland lies in the midst of the great Fossil or Clinton ore belt, extending from Wisconsin through Canada, New York, sweeping thence in a southwestern course through Pennsylvania, Maryland, Virginia, and East Tennessee into Georgia. In the immediate vicinity of the city the beds are tilted on their edge, are poor in iron and rich in lime, and, consequently, small and hard, and cannot be profitably worked. Upon entering Bedford county, Pennsylvania, their character changes, with the accompanying country rock. The veins flanking the sides of Wills and Tussey's mountains are soft, and they dip at steep angles, from 70° to 90°, and are profitably worked. They can be opened above water level by cross-cuts through soft slate; on reaching the vein drifts will be driven in the ore and overhand slopes 100 feet in hight, cheaply and conveniently mined. The ore on the west side of Wills Mountain can be transported by inclines to the Bedford Division of the Pennsylvania Railroad, involving a minimum of cost for transportation. The main or "Soft Fossil" vein varies from one to three feet in thickness, averaging about two feet; the hard fossil from 6 to 12 inches thick, separated from the soft by a foot or two of sandstone, and can often be mined to advantage with the first. At the Cumberland mine, owned and operated by the Cumberland Coal and Iron Company, the ore has the following average composition:

Metallic Iron	41·34
Silica	15·10
Water	6·92
Phosphorus	·51

like all the fossil of this region, it contains only a trace of sulphur, and nearly sufficient lime to flux the silica in the ore. Further north the ore is harder and contains more silica and less iron, as the following analysis of a sample taken from the poorest portion of the vein will show:

Iron	32·47
Silica	30·50
Phosphorus	·42

These ores, if mined with proper care, can be relied on to yield 40 per cent. in the furnace, and will cost $3·80 per ton delivered in Cumberland. Large bodies of the same fossil ores along Tussey's Mountain and the neighboring ranges are at present unavailable, owing to their distance from the railroad. Near Bedford, Pennsylvania, on the Dunnings Creek Branch Railroad, are heavy deposits of fossil ore, which can be quarried by stripping from four to ten feet of soft slate and soil. The dip of these beds is very light, varying from 5° to 10°; they contain from three to four feet of ore interlaid with slate and sandstone, making a total thickness of six to eight feet, and have the following composition:

Metallic Iron	31·75
Silica	8·85
Phosphorus	·37

Although poor in iron the ores contain so large a percentage of lime that a furnace will drive very fast on this stock and make as much iron as if using the 40 per cent. ores. The cost of one ton delivered in Cumberland will be about $3·50, or $10·50 per ton of metal against $9·50 of the 40 per cent. fossil. To partially set off this increased cost there will be a considerable saving of limestone.

The "Big Fossil Vein," also known as the "Levant" or "Block Ore," and found in the Clinton measures, about 1000 feet below the small fossil just described, and usually within 200 feet of the Medina sandstone, has not been opened at any point south of Tatesville, in Bedford county, where it is worked by the Kemble Coal and Iron Company.

This ore crops out near the Narrows, above Cumberland, and south of the city crosses the Potomac and skirts Knobly Mountain, following the course of the Baltimore and Ohio Railroad as far as Keyser city.

Strictly speaking, the deposit here assumes the character of a ferruginous sandstone as the following assays demonstrate:

Sam. of top 3 ft. ore, Metallic Iron	17·06
Sam. of center 4 ft. ore, Metallic Iron	18·88—Silica, 68·89
Sam. of bottom 3 ft. ore, Metallic Iron	18·46

At a point south of Cumberland, surface specimens of the ore assayed 27·77 iron, 0·33 phosphorus, and 54·20 silica. The lower beds are not exposed, but are known to be of superior quality, and will yield about 30 per cent. in the furnace; its remarkable thickness and the low cost at which the ore can be quarried and shipped renders it of economical importance. The ore can be laid down in Cumberland inside of $1·80 per ton. A half-and-half mixture of this, and the limestone fossil of Bedford, will contain 31 per cent. of metallic iron, 28 per cent. of silica, and 36 per cent. of carbonate of lime and other bases. A ton of the mixture costs $2·65, or only $8·48 to the ton of iron, and can be worked in varying proportions with the rich hematites and magnetites of Virginia and Lake Superior, of which more hereafter.

Following the Clinton measures south of Cumberland into Virginia, the next point of importance is in the vicinity of Moorefield; the small fossil veins here attain a thickness of nearly three feet, and yield over 43 per cent. of iron, and are remarkably free from Silica. Their occurence and position is a counterpart of the ores north of Cumberland, and hence offer similar inducements for mining. Large tracts of ore overlap the tops of the mountains, leaving only a few feet of soil as cover. The outcrops of the workable fossil veins have been traced southwest through Hardy, Pendleton and Highland counties to the Chesapeake and Ohio Railroad, and everywhere present the same natural advantages, insuring a cheap and plentiful supply of these ores for furnaces situated in Cumberland. In Morgan county, Va., and in the vicinity of the Great Cacapon River, not quite 40 miles east of Cumberland, are local deposits of hematite, yielding from 35 to 40 per cent. of iron, and containing scarcely a trace of phosphorus. The ore requires washing, and can be shipped by canal and delivered at $4·25 per ton. A charcoal furnace has been running on the ore of one of these deposits for many years, and produces excellent iron.

The second great range of ores, important to Cumberland, is found in a course parallel with the fossil along the outcrop of the Lower Silurian Limestones forming the base of the Great North Mountain and the Shenandoah Valley. The ores are hematites and limonites, practically free from sulphur and phosphorus, and occur in an almost continuous deposit from a point twenty miles south of Winchester, Frederick county, through Shenandoah and Rockingham counties, crossing the Chesapeake and Ohio Railroad near Staunton, Augusta county, and turning thence in a southwestern direction into Tennessee.

The deposits are in many instances above water level, and can be mined by open cut and transported to the valley by inclines and tramroads. An average sample from Frederick county assayed:

42·00 per cent. Metallic Iron.
·20 per cent. Phosphorus.

A number of samples from the vicinity of Staunton contained 10 to 15 per cent. of moisture, no phosphorus, traces of sulphur, and the following yield of Metallic Iron:

	No. 1.	No. 2.	No. 3.	No. 4.
Metallic Iron	54·33	51·39	63·26	53·72
Silica	11·13	8·99	2·23	3·51

These ores can be mined, and royalty paid, for $2·35 per ton, and will not cost over $5·50 per ton delivered in Cumberland.

Of the thirty-five charcoal furnaces blowing in Virginia more than twenty-five are supplied from this wonderful belt of ore, and all are favorably known for the excellence of their product. Worked alone the ore makes a strong foundry or mill iron, suitable for every purpose; calcined and used with fossil it will make a soft foundry which compares favorably for strength and the amount of scrap that can be added, with the renowned Scotch pig. The ores can be transported by the Valley Railroad, a branch of the Baltimore and Ohio, direct to Cumberland, or shipped by canal from Harper's Ferry.

In the vicinity of Fredericktown, Md., and in proximity to the railroad, are fine deposits of hematite, similar in appearance to the ores found near Baltimore, from which the well-known car wheel iron is smelted. The following is an analysis of a sample of "Lump Ore:"

Metallic Iron	52·32
Silica	7·08
Phosphorus	1·78

A single deposit has been opened to the depth of nearly one hundred feet, and exhibits their general character. The ore is found in irregular masses, often weighing many tons, imbedded in a soft clay and gravel, and will not require the labor of experienced miners in its extraction, thus materially reducing the cost, which will be about $4·50 per ton in Cumberland. The water collecting in the mine requires pumping, and can be profitably employed in washing fine ore.

Twenty miles east of Frederick a vein of slightly magnetic specular ore, containing considerable manganese has been opened. The walls are well defined, showing a width of eight feet. The country rock is slate, and dips almost vertical, comformably with the vein. An average sample assayed 33·07 per cent. of iron and traces of sulphur and phosphorus; hence, the ore is adapted to the manufacture of Bessemer, Martin or crucible steel. Its cost in Cumberland will not exceed $5 per ton.

Prolonging the course of the vein into Virginia, it follows the eastern slope of the Blue Ridge, traversing Fauquier, Rappahannock, Madison, Green and Albemarle counties, where valuable deposits of rich titaniferous magnetites have recently attracted attention. Allowing $3 per ton for mining (which is a liberal estimate), a 50 per cent. ore, free from phosphorus, can be delivered at the furnace bank in Cumberland for $6·20 per ton.

Last, but not least, Lake Superior ores can be shipped *via* Cleveland or Sandusky, and the Pittsburgh & Connellsville, or Baltimore & Ohio Railroads, and delivered at an advance of $2 per ton on their cost in Pittsburgh. Mixed with the first mentioned magnetic ores, the percentage of titanium can be reduced in the stock so as not to interfere with the regular working of the furnaces, and the cost of the ore per ton of iron will then be below Pittsburgh rates.

Beside these inexhaustible sources of supply of rich ores, the large and ever increasing shipments of coal from Cumberland to tidewater, and thence to all ports on the Atlantic, offer ready means of cheap return freights for North Carolina magnetites and the pure African hematites. The toll from Georgetown, by canal, is 46 cents per gross ton, and the total cost of transportation will not exceed $1·30. African ores, containing 62 per cent. of metallic iron, and worth $10 per ton at tidewater, will therefore cost $11·30 in Cumberland.

A detailed account of the three great parallel zones of fossil, hematite and magnetic iron ores contained in the folds of the Alleghenies being impracticable within the limits of this pamphlet, I have, in the foregoing description, aimed to present a general view of the vast mineral wealth available to, and waiting its development by, the energy of the Cumberland manufacturer, and the unusual facilities for the transportation of the finer ores enjoyed by this central situation.

An abundance of limestone is found in and near Cumberland. At one point a stone of the Helderberg formation, containing only 2·5 per cent. of silica, rises in a bold cliff 100 feet in hight, presenting every advantage for quarrying. At its base runs the Baltimore & Ohio Railroad, and a few hundred feet further the Potomac empties into the Chesapeake and Ohio Canal basin. Limestone would hardly cost 80 cents per ton at this point. Niagara limestone of fine quality and unlimited quantity is found a few miles south, near the Potomac.

The far famed Cumberland, or George's Creek, coal is too well known to require any special notice, containing, as it does, over 75 per cent. fixed carbon; a ton of coke can be made in modern Belgian ovens with an expenditure of 1⅛ tons of coal. Hence, works owning ovens can produce coke for $2·80 per ton, and, if they likewise are owners of coal lands, for $2·40 per ton.

A pair of modern furnaces, at least 18 feet in the bosh and 70 feet high, built with all labor saving improvements, ample hot blast, blowing engines, calcining kilns and coke ovens, could manufacture iron at the following cost.

A cold short iron, containing 1·3 per cent. phosphorus, made exclusively from 40 per cent. fossil:

2⅛ tons ore at $3·80	$9·50
1 ton limestone	·80
1⅛ tons coke at $2·80	4·20
Labor and salaries	3·50
Materials and general expenses	1·00
	$19·00

A neutral iron containing 0·7 per cent. of phosphorus and some titanium, smelted from a 40 per cent. stock of equal parts of the levant and limestone fossil mixture and titaniferous magnetite, which stock will yield sufficient cinder to prevent any difficulty from the refractory character of the titanium ore:

2⅛ tons ore at $4·32½	$10·80
1¼ tons stone at 80 cents	1·00
1½ tons coke at $2·80	4·20
Labor	3·00
Materials	1·00
	$20·00

Estimating the average cost of North Mountain and Fredericktown hematites at $5·20 per ton, and their yield at only 45 per cent., and, further, allowing the make of the furnaces to increase 8 per cent. on the calcined and richer stock, the cost of a strong mill iron containing, according to the ores used, from 0·10 per cent. to 1·71 per cent. phosphorus, will be as follows:

2¼ tons ore at $5·20	$11·70
1 1-5 tons stone at 80 cents	96
1¼ tons coke at $2·80	4·20
Labor	2·75
Materials	92
	$20·53

Bessemer, soft foundry, or a red short forge iron, made from various proportions of picked and calcined Virginia hematites, limonites, and titaniferous magnetites, worth an average of $5·60 per ton:

2 tons ore at $5·60	$11·20
1 ton stone at 80 cents	80
1¼ tons coke at $2·80	4·20
Labor	3·00
Materials	1·00
	$20·20

Iron made exclusively from African ores:

1⅝ tons ore at $11·50	$18·36
¼ tons stone at 80 cents	50
1¼ tons coke at $2·80	3·50
Labor	2·10
Materials	·60
	$25·06

The preceding estimates are based on the actual work done at a furnace near Cumberland, and represent the maximum cost of the iron in every instance; proving conclusively that Cumberland can manufacture iron from $3 to $4 per ton cheaper than Pittsburgh, where the cost of production, from a mixture of mill cinder and lake ore is about $24 at present. With a superior coal no more expensive, the excellent Mount Savage and Savage Mountain fire brick from $5 to $6 per 1000 less costly, and labor a trifle lower than in Pittsburgh, wrought iron can be manufactured at a proportional reduction in cost.

Estimating the loss of metal from pig to the finished product at 15 per cent., the necessary fuel consumed in puddling and heating at two tons, and the fettling at 225 lbs. of ore per net ton of merchant iron, its cost to a company owning mines and furnace will be approximately as follows:

Pig iron at $20 per ton	$21·00
Coal	3·50
Fettling	1·00
Labor and superintendence	16·00
Materials and repairs	2 00
	$43·50

Leaving a margin of $10 per ton at present prices.

Recognizing the advantages possessed by Cumberland, the Baltimore and Ohio Railroad Company, in 1870, built a large rail mill, and have since added a bar mill, which, by efficient management, have proved a valuable addition to the revenues of the corporation. This mill is at present reaping the benefits of being the only consumer of pig iron in the neighborhood.

Mills and furnaces once established, a bright future awaits Cumberland; situated on a great through route extending from Chicago to Baltimore, with numerous connections to the South and North, and with the canal as a highway to the Atlantic, an essential element of successful manufacturing, viz., "cheap transportation," is assured. An establishment located in Cumberland, manufacturing light T rail, punched strap iron, merchant bars, boiler plate and sheet iron, with the double advantage of low first cost and light freights, will find a large market for its goods in the Cumberland and Broad Top mining regions, and would soon monopolize the Eastern, Southern and South American trade. The same is true, to a still greater degree, of factories of spikes, nails, brads, tacks, rivets, bolts, washers, nuts, and heavy hardware generally, as well as of bridge and roof, wrought iron pipe, boiler and locomotive building. Encouraged by cheap foundry iron, manufacturers of stoves, cast iron pipe, portable and stationary engines, and every class of machinery, will locate their works in Cumberland and enter the ranks of the consumer.

Since Bessemer iron can be produced as cheap here as elsewhere, steel can be manufactured with equal economy. Estimating the value of the iron at $30 per ton, the cost of a ton of steel rails produced by the American plant of two five-ton converters will be as follows:

Pig iron	$35·00
Wages	10·00
Fuel	5·50
Spiegeleisen	5·00
Repairs and materials	2·00
	$57·00

At 7 per cent. the interest on capital invested added to the sinking fund would be nearly $10 per ton, or a total of $67·50, which, even at present prices of steel rails, would leave a margin of $2 50 per ton. Crucible steel works containing a Siemens and blister furnace, producers, etc., are now successfully operated in Cumberland, producing a superior article at less cost than in Pittsburgh; thus enabling manufacturers of springs, shovel, hoe, cultivator, and plow steel, files, rasps, axes and every descriptions of edge tools, to establish themselves profitably.

Thus it will be seen that nature has bountifully supplied Cumberland with those gifts which will, in the near future, give it the importance to which, by its resources and position, it is entitled. The manufactures of iron and steel are yet in their infancy, but not many years will elapse ere what now is but a country town will hear the hum and stir of busy workers, and will see the tall stacks of many mills belching forth their clouds of smoke, speaking in fiery tongues of the energy and prosperity of their founders. And then in truth the Cumberland manufacturer may point with pride to his native town, and call it "The Queen City."

NOTE.—The analyses in the foregoing article were made by Prof. C. F. Chandler, Ph. D. School of Mines, New York, and J. Blodgett Britton, Philadelphia.

Shipment of American Iron to England.—The Birmingham *Post* says: "Much discussion was some time ago occasioned respecting a shipment of American iron for sale and use in England. At the time it was thought that finished iron had been sent across from the States, but the explanation was that the transaction had been an experimental consignment of good pig iron. In fact, it was a lot of Alabama and Georgia pig, for which the makers had hoped to get £8 per ton, but that when sold in Liverpool did not realize more than £7 net. This figure, however, left profit, though but very small. We have authority for saying that the Cornwall Iron Company, of Cedar Bluff, Cherokee county, Ala., are preparing to ship to the same destination 100 tons of their charcoal (pig) iron. The comparative nearness in point of cost of this country to the pig making furnaces of the Southern States is to be observed in the fact that the first consignment was conveyed to Liverpool at only $1 a ton more than it would have cost to take the same iron from the furnaces to Cincinnati."

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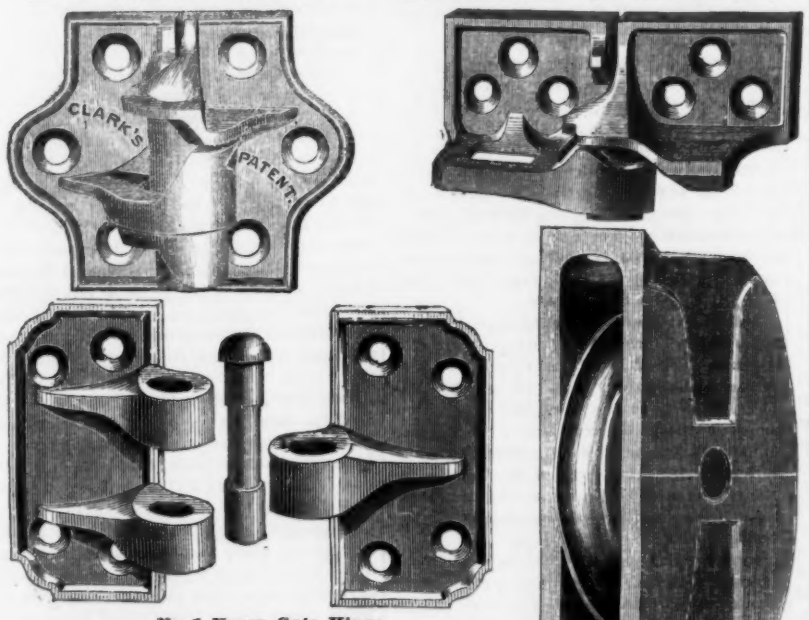

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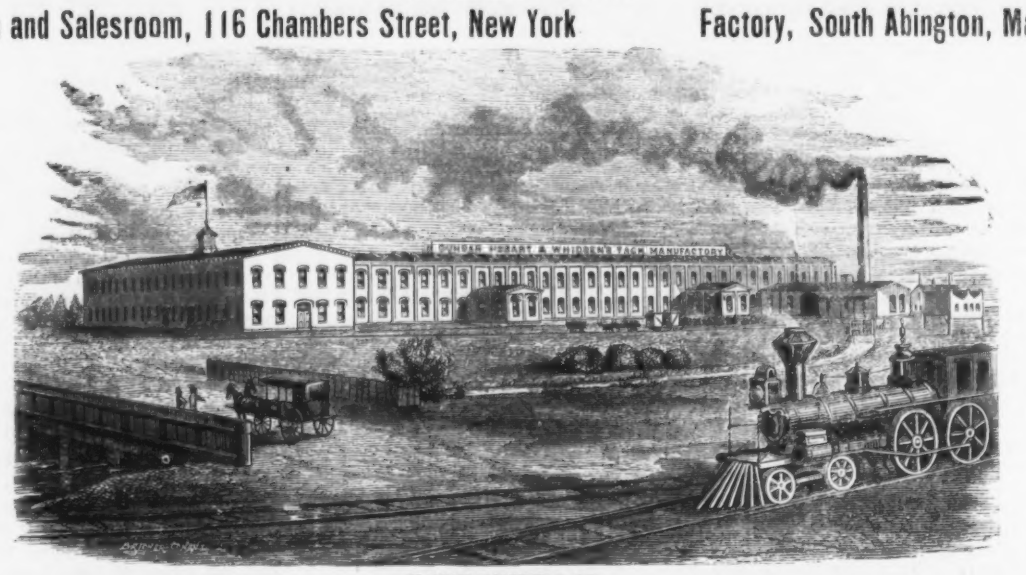

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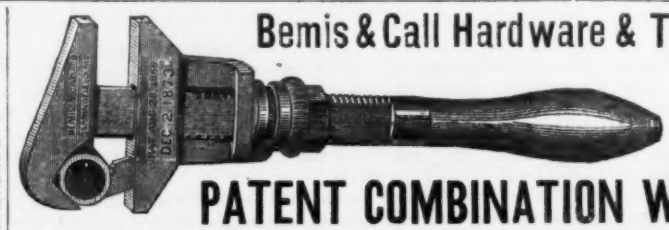

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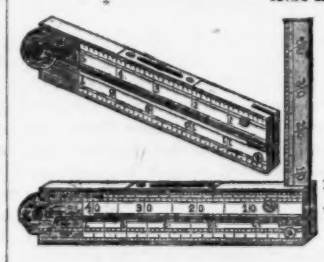

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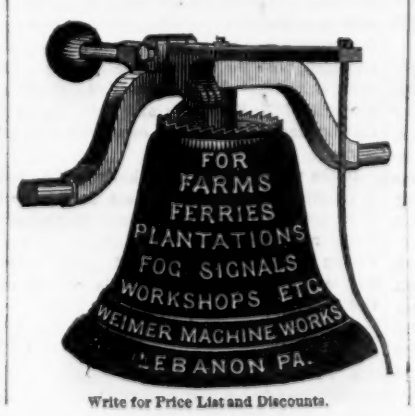

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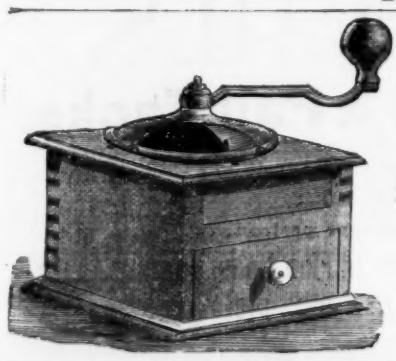

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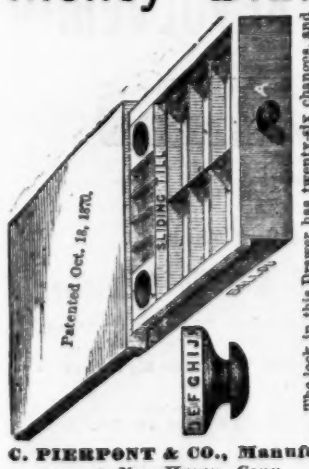

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Working Men's Trains.

At a joint meeting of the Public Health and Dwelling Reform Association, held in the lecture room of Columbia College on Saturday evening last, the subject of working men's trains was taken up and discussed, and it was resolved that a committee be appointed to confer with the superintendents of the various railroads and steamboat lines centering in New York, and doing a local business, upon the feasibility of adopting some arrangement of trains or boats and fares similar to the working men's trains upon the Eastern Railroad in Massachusetts. These cheap trains were adopted by the Eastern Railroad at the suggestion of the Massachusetts Railroad Commissioners. At that time—1872—the management of the Eastern road had a strong desire to make its co-operation popular, and it was by taking advantage of this that the commisioners secured the adoption of a plan which has proved not only unexpectedly successful, so far as the public is concerned, but also handsomely profitable.

These trains leave Lynn for Boston over the Eastern Railroad at 5·35 o'clock each morning, and returning, leave Boston at 6·35 in the evening; the fare is uniform (5 cents) for all distances, whether the entire trip or any part of it. The tickets for this train are sold only in slips of twenty each, and no money is received on the cars, the regular fares being exacted, each passenger represents a five cent fare to the road; the receipts of the company from this source throughout the year averaged $21·29 per trip.

Begining in November, 1872, with two cars only, these trains have steadily increased in size, owing to the increase in the number of passages until, in August last, 11 cars were required. At the present time, nine is the usual number. At first these trains seemed to be regarded with a certain popular suspicion, especially by women, who used them but little. This is now rapidly changing, numbers of women go in them, and generally the class of passengers shows a constant and decided tendency to improvement.

In commenting on the course of this experiment in their last annual report, the commissioners called attention to the important fact that the statistics of the several stations served by the cheap trains very clearly showed that those trains had not diminished the receipts by the regular trains, nor drawn passengers from them, but that they had apparently called a new class of travel into existence which, if it had any effect at all on other and regular travel, seemed rather to stimulate and develop. The same thing has continued noticeable during the year just past. While the travel on the cheap trains between Boston and Lynn has increased 42 per cent., that on the regular trains, so far from showing any signs of diminution, has increased 23 per cent. From these facts but one inference can apparently be drawn. The introduction of the system of cheap trains has largely extended on the Eastern road the area in which labor can seek employment. The workingmen can now daily carry his labor to any point where he can find a market for it, from Lynn to Boston. As a consequence of this the population moves much more. Men and women go in one class of trains and return in another, and they go and return far more frequently than formerly and for reasons of less importance. The habit of traveling is acquired, and once acquired it will not limit itself to any particular mode of travel. Apparently their experience has satisfied those managing the Eastern Railroad of the truth of these propositions, as they have this year evinced a lively interest in the results of the experiment, and show no disposition whatever to bring it to a close.

If the rate of progress which has hitherto been maintained is continued, the indications are that in another year the Eastern Railroad workingmen's trains will be found to be among the most remunerative, per mile run, which leave the city of Boston. The only difficulty seems likely to arise from their unmanageable size.

The following table shows what the results have been from the practical standpoint of how the experiment paid and how it affected the other traffic of the road during the two years of the trial:

	Number of Passengers.		Receipts.	
1873.				
Regular trains	331,461		$52,182·79	
Workingmen's trains	187,016		9,350·80	
		568,477		$61,533 59
1874.				
Regular trains	468,920		$60,610·60	
Workingmen's trains	266,560		13,338·00	
		735,480		$73,948·60

NUMBER OF PASSENGERS FOR EACH MONTH IN YEARS 1873 and 1874.

Months.	1873.	1874	Per ct. of gain.
December (1872)	7,481	14,260	91
January	7,445	15,000	101
February	8,264	15,620	89
March	11,146	17,150	54
April	13,977	18,800	34
May	17,720	21,220	20
June	21,053	27,760	32
July	20,393	26,800	31
August	22,957	28,740	25
September	20,851	30,260	46
October	19,816	29,310	48
November	15,908	21,540	35
Total	187,016	266,560	42·5

	Per cent.
Increase of gross receipts of Eastern Railroad for year ending Sept. 30, 1874	34
Increase of net receipts of Eastern Railroad for year ending Sept. 30, 1874	82
Increase of gross receipts of workingmen's trains for year ending Nov. 30, 1874	42·5
Net loss of operating workingmen's trains for year ending Nov. 30, 1873	13·6
Net gain of operating workingmen's trains for year ending Nov. 30, 1874	50·6
Gain in regular passengers on Saugus Branch for year ending Nov. 30, 1874	22·9
Gain in workingmen passengers on Saugus Branch for year ending Nov. 30, 1874	42·5
Gain in regular receipts on Saugus Branch for year ending Nov. 30, 1874	16·1
Gain in regular passengers on Saugus Branch for 1874, compared with 1872	23·5
Gain resulting from workingmen's trains for 1874	87·2
Total gain in travel on Saugus Branch for 1874, compared with 1872	140·7

The growth of travel on these trains has averaged 42 per cent. for the present year. It was highest in January (101 per cent.) and lowest (20 per cent.) in May. The average receipts were $21·29 per trip.

According to the returns of the Eastern Railroad the average cost of running a passenger train is $1·088 per mile, or $14 14 for the trip from Boston to Lynn. During the second year the cheap train not only paid its expenses, but earned a net profit at the rate of $7·15 per trip, or 55 cents per mile run. The average net earnings of passenger trains on the same road during the year were 48·4 cents per train mile, showing that the cheap 5 cent train was 14 per cent. more profitable than the average passenger train. As compared with the previous year, the regular passenger earnings of the Eastern Road increased 30·4 per cent. as respects the gross receipts and 10·7 per cent. as respects net receipts, whereas the increase in the gross receipts of the cheap train was 42 per cent., while the net loss of 15 per cent. on cost of operation in 1872–3 was converted into a net profit of 51 per cent. in 1873–4. During the former period the earnings of the cheap train were 15 per cent. of the entire passenger receipts of the Saugus Branch, and during the latter period they were 18 per cent.

The commissioners, in conclusion, say that the only way for a community to obtain such accommodation is to give an organized expression of their desire for such service. This advice, though especially directed toward the people of Massachusetts, is equally appropriate to the situation in this city. Cheap transportation for the working classes means, in the end, cheap labor, and cheap labor is certainly one of the demands of the time and necessities of our country. Cheapening the transportation reduces the expenses of the working classes, giving them cheaper living in better localities, so that the smaller amount of money has really a greater purchasing power than the larger sum expended in the city.

Dilation of Iron at the Melting Point.

The conclusions of Mr. Mallet upon the "Dilatation of Cast Iron and the Phenomena of the Crane Ladle," published in our February number, have excited so much interest that we republish here, from *Nature*, an abstract from his previous paper before the Royal Society, which has the above title. Mr. Mallet's well known ability makes his opinion upon these matters of great scientific value.

Since the time of Reaumur it has been stated, with very various degrees of evidence, that certain metals expand in volume at or near their points of consolidation from fusion. Bismuth, cast iron, antimony, silver, copper and gold are amongst the number, and to these have recently been added certain iron furnace slags. Considerable physical interest attaches to this subject from the analogy of the alleged facts to the well known one that water expands between 30° Fahr. and 32°, at which it becomes ice; and a more extended interest has been given to it quite recently by Messrs. Nasmyth and Carpenter having made the supposed facts, more especially those relative to cast iron and to slags, the foundation of their peculiar theory of lunar volcanic action as developed in their work "The Moon as a Planet, as a World, and a Satellite" (4to, London, 1874). There is considerable ground for believing that bismuth does expand in volume at or near consolidation; but with respect to all the other substances supposed to do likewise, it is the object of this paper to show that the evidence is insufficient, and that with respect to cast iron and to the basic silicates constituting iron slags, the allegation of their expansion in volume, and therefore their greater density when molten than when solid, is wholly erroneous. The determination of the specific gravity in the liquid state of a body having so high a fusing temperature as cast iron is attended with many difficulties. By an indirect method, however, and operating upon a sufficiently large scale, the author has been enabled to make the determination with considerable accuracy. A conical vessel of wrought iron of about 2 feet in depth and 1·5 feet diameter of base, and with an open neck of 6 inches in diameter, being formed, was weighed accurately empty, and also when filled with water level to the brim; the weight of its contents in water, reduced to the specific gravity of distilled water at 60° Fahr. was thus obtained. The vessel, being dried, was now filled to the brim with molten gray cast iron additions of molten metal being made to maintain the vessel full until it had attained its maxium temperature (yellow heat in daylight) and maximum capacity. The vessel and its contents of cast iron when cold were weighed again, and thus the weight of the cast iron obtained. The capacity of the vessel when at a maximum was calculated by applying to its dimensions at 60° the coefficient of linear dilatation, as given by Laplace and others, to its range of increased temperature; and the weight of distilled water held by the vessel thus expanded was calculated from the weight of its contents when the vessel and water were at 60° Fahr, after applying some small corrections.

We have now the elements necessary for determing the specific gravity of the cast iron which filled the vessel when in the molten state, having the absolute weights of equal volumes of distilled water at 60° and of molten iron. The mean specific gravity of the cast iron which filled the vessel was then determined by the usual methods. The final result is that, whereas the specific gravity of the cast iron when cold is 7·170 it was only 6 650 when in the molten condition; cast iron, therefore, is less dense in the molten than in the solid state. Nor does it expand in volume at the instant of consolidation, as was conclusively proved by another experiment. Two similar 10 inch spherical shells 1·5 inches in thickness, were heated to nearly the same high temperature in an oven, one being permitted to cool empty as a measure of any permanent dilatation which both might sustain by mere heating and cooling again, a fact well known to occur. The other shell, when at a bright red heat, was filled with molten cast iron and permitted to cool, its dimensions being taken by accurate instruments at intervals of 30 minutes, until it had returned to the temperature of the atmosphere (53° Fahr.), when, after applying various corrections, rendered necessary by the somewhat complicated conditions of a spherical mass of cast iron losing heat from its exterior, it was found that the dimensions of the shell whose interior surface was in perfect contact with that of the solid ball which filled it were, within the limit of experimental error, those of the empty shell when that also was cold (53° Fahr.), the proof being conclusive that no expansion in volume of the contents of the shell had taken place, which was further corroborated by the fact that the central portion was found much less dense than the exterior, whereas if the cast iron expanded in consolidating the central portions must be more dense than the exterior.

It is a fact, notwithstanding what precedes and well known to iron founders, that certain pieces of cold cast iron do float on molten cast iron of the same quality, though they cannot do so through their buoyancy, as various sorts of cast iron vary in specific gravity at 60° Fahr., from nearly 7·700 down to 6 300, and vary also in dilatability; that thus some cast irons may float or sink in molten cast iron of different qualities from themselves through buoyancy or negative buoyancy alone; but where the cold cast iron floats upon molten cast iron of less specific gravity than itself, the author shows that some other force, the nature of which yet remains to be investigated, keeps it floating; this the author has provisionally called the repellent force, and has shown that its amount is, *cæteris parabis*, dependent upon the relation that subsists between the volume and "effective" surface of the floating piece. By "effective" surfece is meant all such part of the immersed solid as is in a horizontal plane, or can be reduced to one. The repellent force has also relation to the difference in temperature between the solid and the molten metal on which it floats.

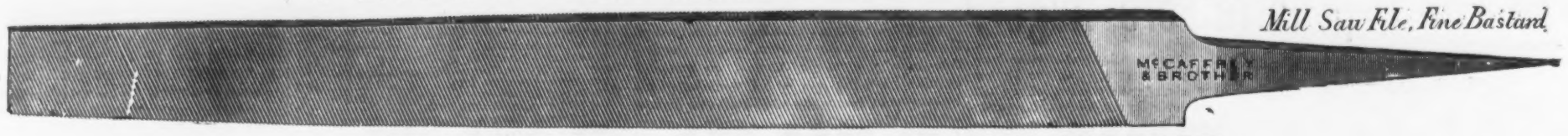
The author then extends his experiments to lead, a metal known to contract greatly in solidifying, and with respect to which there is no suggestion that it expands at the moment of consolidation. He finds that pieces of lead having a specific gravity of 11·361 and being at 70° Fahr. float or sink upon molten lead of the same quality, whose calculated specific gravity was 11·07, according to the relation that subsisted between the volume and the "effective" surface of the solid piece, thin pieces with large surface always floating, and *vice versa*. An explanation is offered of the true cause of the ascending and descending currents observed in very large "ladles" of liquid cast iron, as stated by Messrs. Nasmyth & Carpenter. The facts are shown to be in accordance with those above mentioned, and when rightly interpreted, to be at variance with the views of these authors.

Lastly, the author proceeds to examine the statements made by these authors, as to the floating of lumps of solidified iron furnace slag upon the same when in a molten state; he examines the condition of the alleged facts, and refers to his own experiments upon the total contraction of such slags, made at Barrow Iron Works, and a full account of which he has given in his paper on the true nature and origin of volcanic heat and energy, printed in Phil. Trans., 1873, as conclusively proving that such slags are not denser in the molten than in the solid state, and that the floating referred to is due to other causes. The author returns thanks to several persons for facilities liberally afforded him in making these experiments.

The Chandor Light.

At a *conversazione* recently held in Edinburgh, Prof. Archer drew attention to a new and very important invention—the Chandor light—which really threatens the lucifer trade with extinction. The apparatus is, in outward appearance, a little tube 3 in. or 4 in. long, having at one end a revolving button which turns a screw, and at the other a minute angular point of metal, which also revolves, passing over a little orifice in the closed head of the tube. A continuous fuse, formed of a delicate strip of solidified collodion, with a ridge of hardened phosphorus on one of its sides, is slipped into the tube, and once in position, can be moved upward by the screw. By the same action which presses the upper end of the fuse against the opening at the top the metal point is turned upon the phosphorus, and a small portion of the collodion is thereupon ignited. When the apparatus is affixed to a gas burner only a very transient flash is needed for the purpose of ignition, and not more than a seventieth part of the collodion fuse is in that operation consumed. Where, however, the wick of a lamp has to be lit by the same means, a larger portion of the fuse, the thirty-second part, in fact, is burned. The apparatus is either portable or adapted to the uses indicated. If a lamp goes out it can be instantly relighted by the turn of a screw, instead of by opening the case, removing the chimney, and striking a lucifer match where, perhaps, large quantities of straw are lying about. The collodion fuse is so little liable to be effected by damp that it will ignite after having been immersed in water, and its action has never been known to fail. Being encased in a close fitting chamber within the tube it cannot burn beyond the requisite point where its duty is discharged, and the cotton wick, or invisible spirit of gas, "starts into light and makes the lighter start."

PENNSYLVANIA FILE WORKS.



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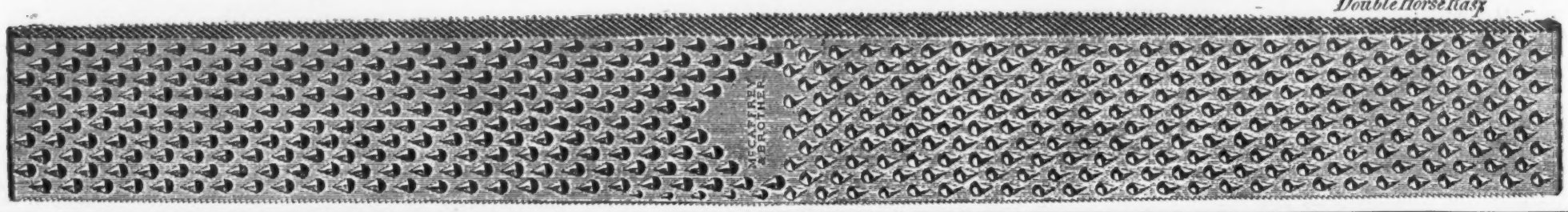

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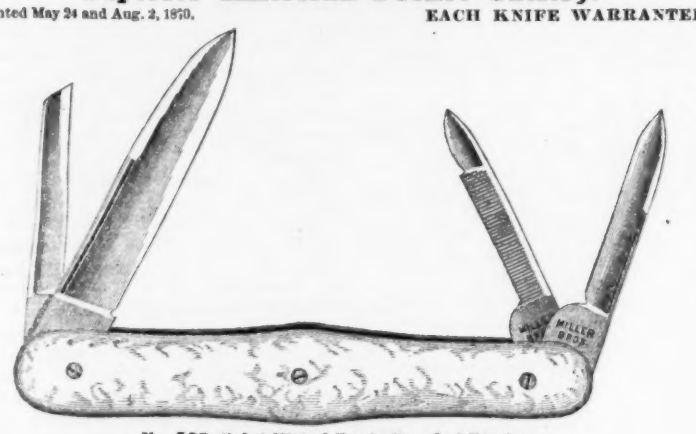

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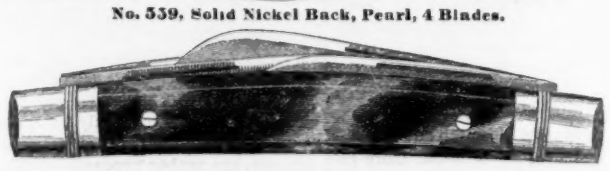

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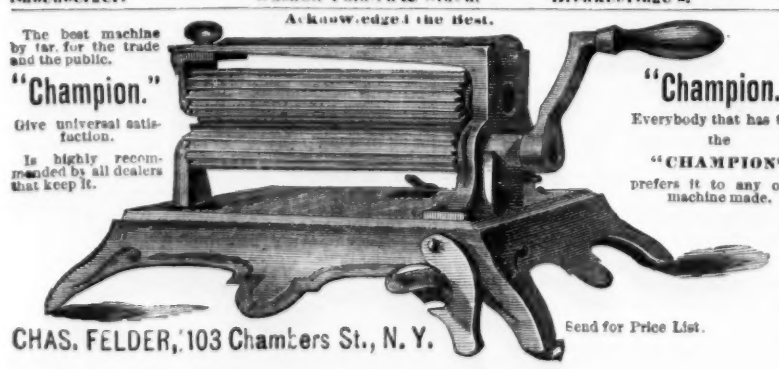

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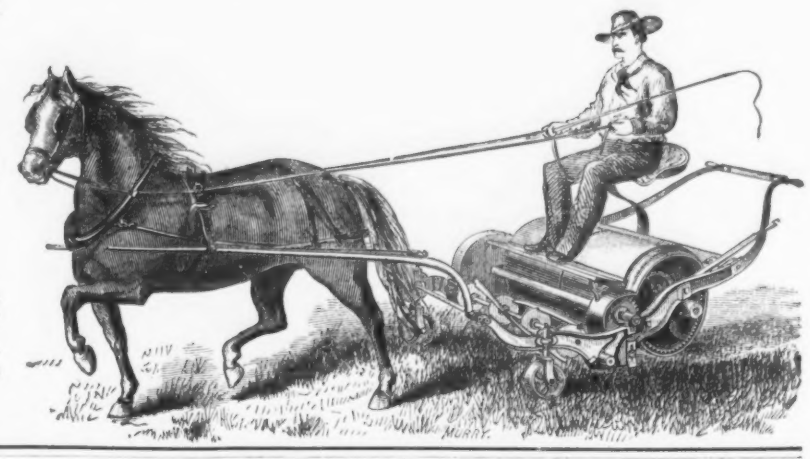

The Great Trial.

At the trial held in New York city, on the 25th of June, 1874, the **New Excelsior** was awarded the First Premium (a Silver Medal) by the American Institute, in competition with all the different Lawn Mowers now made in this country.

The New Jersey State Agricultural Society, at its Annual Fair, in September, 1874, awarded the **New Excelsior** the highest honor and the First Premium (a Silver Meda') after a full and fair test of its merits as compared with three other of the principal Lawn Mowers now in use.

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Erection of Iron Piers in Exposed Positions.

In a recent number of *The Iron Age* we published an account of some of the more notable piers on the British Coast. We give below a description of some of the methods employed for sinking holes for piles and other operations connected with the securing of foundations for piers in very exposed situations. The author is Mr. J. W. Wilson, Jr., from whose paper on the subject of piers we have previously made extracts. The author begins his remarks by some little description of the pier and shore at Westward Ho! in North Devon:

The works in question afford much valuable information in this species of work. The Westward Ho! pier runs out seaward from the shore of that watering place in Biddeford Bay, extending in a northerly direction, and was erected by a company in order to serve as an additional attraction to builders as well as visitors to this spot, named after and rendered famous by the book of the same name written by the late lamented Canon Kingsley. The foreshore below the cliff, which is entirely composed of rocky shale, at an angle of about 45 degrees, is covered at high tide with a depth of from 6 feet to 33 feet of water. The shore falls from below the cliff at an incline of about 1 in 35 for a distance of about 360 feet, when there occurs a sudden fall of 12 feet or 14 feet, the shore then running out seaward at a gradual slope of 6 inches in 100 feet. These upper and lower plateaux are of most irregular surface, the upper one especially being intersected by deep gulleys. The shale is much hardened on the upper or exposed surface, and forms a most unpleasant and indeed dangerous surface to walk upon; in fact, there is no boating at Westward Ho! These two plateaux are moreover covered with large oblong flint and other boulders, varying in size from 6 inches to 2 feet or even 3 feet diameter, and occasionally larger still. These boulders are being constantly rolled about in all directions by the action of the waves, which in the calmest weather are almost constantly in motion, and assume frequently gigantic proportions during stormy weather, the rollers coming in with great force from the Atlantic. The first contractor for the pier, indeed, who was, however, given to exaggeration at times, was wont to declare that he had seen the largest sized masses of rockwork cast bodily over the deck of the pier during a storm.

The pier is erected upon cast iron columns, with the exception of the head, where the greater depth of water necessitated the use of the wrought iron columns. Both descriptions of columns are placed upon cast iron cylindrical piles, the fixing of which, in the seaward portion of the structure, was a part of the work which absorbed a great portion of the time of erection; as, in consequence of the hard and rocky nature of the ground, the pier could not be erected in the usual manner upon screw piles, it became necessary to adopt some other arrangement, and the piles ultimately employed were of hollow cast iron. The holes required to receive these were sunk in the rock by means of jumping; and this remained a comparatively easy matter so long as by the fall of the tide the ground was left comparatively dry at times, but when, toward the outer end of the pier, the work was constantly under water, the progress became much slower in consequence of the terribly grinding quality of the rock when wet.

The following is a description of the plan adopted by the second contractor, Mr. John Abbot, of Biddeford, for preparing the holes for, and sinking the piles in the foreshore under water: The piles were of lengths varying from 12 ft. to 15 ft., as required by the formation of the ground and the arrangement of the superstructure, and they were of 11 in. external diameter. The holes in the rock to receive them were 12 in. in diameter. The depth of water over the holes varied from 6 ft. at low water springs to upward of 30 ft. at high water. An outrigger was constructed of timber to project 35 ft. beyond the present end of the pier; this outrigger being supported at the extreme end by spars shod with iron, resting upon the rock in which the holes had to be worked. An iron cylinder 8 ft. long and of 14 in. internal diameter, made in halves and jointed, the joint being parallel to the length, was lowered on each side of the outrigger, and kept in an upright position by being firmly secured to the spars. The position of the outrigger, spars and cylinders was arranged so that the cylinders stood on the rock exactly over the site of the required hole. Through the cylinder thus placed the jumper worked. This jumper was a four-winged tool, with a 6 in. leading point, the shaft being round and of 3 in. diameter; the total length 4 ft. 6 in. The jumper was further connected to upright rods of 2 in. round iron, screwed together in lengths. The top of the jumper rod was fastened to a shackle and chain which led over a pulley (placed upon the framework which was erected on the outrigger) exactly over the center of the hole. A strong rope was taken from this chain through guide pulleys to a winch barrel, which was driven by a portable steam engine on the deck of the pier. Two men were stationed at this winch barrel with the ends of the ropes which were to lift the jumper coiled twice round. By hauling on the free end until the jumper rope had been drawn in 3 ft. or 4 ft., and then suddenly surging or letting go, and steadily repeating the process, a constant rise and fall of the jumper was easily maintained through the cylinder on to the rock. An arrangement of bevel gear at the top of the jumper rods enabled them to be slightly revolved from time to time at each occasion of the rising of the jumper, and an excellent and truly round hole was thus effected.

When the jumper had entered to the required depth and the hole was consequently complete, the tool was withdrawn, and a pile lowered without difficulty into its place. The attendant diver then, through doorways made to open through the lower part of the cylinder, secured the pile in position by means of the customary wrought iron wedges and concrete. After the columns, brackets, &c., had been built on the piles, the joint rod of the cylinders was withdrawn; the cylinders then parted in halves, and were easily removed, to be employed again in a similar operation.

With regard to the time taken in working these holes under water in a more or less constant surf, it is impossible to arrive at any fair average calculation, inasmuch as this depended in so great a degree upon the presence or absence of ground seas. The effect of the bottom scour of the ground sea was often to fill up the hole with gravel, slough, small pebbles, &c., even faster than the jumper worked down, so that often a hole which was, say, 2 ft. deep in the morning would, after a day's steady work, be only 1 ft. deep in the evening, and if jumping were suspended for two or three hours, would be entirely filled up.

The plan at last invariably adopted was, after starting a hole not to stop day or night until it was completed. By working in this manner some of the holes were put down in 24 hours, while in many cases it was a week or even longer before the full depth was accomplished. It should be borne in mind that the rocks in which the foundation holes for the pier had to be worked were always covered with from 6 ft. to 30 ft. of water, a constant surf, and often very heavy ground seas. There was no possible approach to the work by boat, rafts, or any floating contrivance; no approach at all except from the outrigger above, and this had often to be projected with danger and difficulty, in consequence of the great surf.

There are many points of interest about this structure to mention, which would exceed the limits of a paper. The general dimensions of the work have been given before, in the article upon Iron Piers; it may be mentioned, however, that it is supplied with lifting stairs at the head, which may be readily unshipped at the lower end, and brought up level with the dock on the approach of stormy weather. The engineer to the work, aware of the great force of the waves on this coast, was especially careful to design the whole of the work, and, amongst other parts, the tee iron stretchers, extending between the columns above and below, so as to have them supplied much larger and stouter than is customary in such cases; but still, notwithstanding these precautions, in many instances the stretchers have been found to be bent to the extent of at least 2 in. out of the straight line in a length of 12 ft. or 13 ft., although they were 5 in. tee irons, and of ¼ in. thickness of metal. This effect was proved not to have been caused by any blow from the rolling boulders, but simply from the force of the waves.

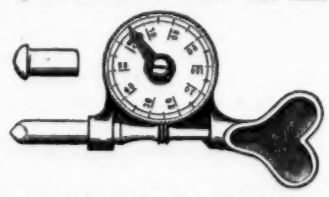
It has been mentioned that the original contractor for the pier failed to complete his contract. During one of the tremendous gales so common on this coast, when the true Atlantic swell comes rolling in, carrying all before it, some of the fixed staging and columns were carried away, and this led to the giving up of the contract. Such experiences were not likely to tempt others to continue the work, and many of those interested in the undertaking were not a little astonished when Mr. John Abbott, of Biddeford, offered to take up the matter, for this gentleman had never undertaken such an affair before, and well knew that his experience was likely to be dearly bought. However, the work was placed in his hands, and in the face of obstacles which would have deterred men of less resolution, his indomitable perseverance enabled him to carry the construction to a successful issue. It is seldom that we meet with such a case, and it reflects the greatest credit upon Mr. Abbott, and is well deserving of honorable mention.

Works in the sea are for many reasons attractive to the engineer, but there is no doubt that in such undertakings he has to contend with an enemy of enormous power in the mighty waters. There are, however, some who are never so happy as when they feel that they are coping with an antagonist whose strength is a match for their own, and with some chance of success, and who, like Alexander, would weep if they felt that they had no more worlds to conquer. To such it is given to bring into subjugation the forces of nature, and even to say to the sea, "Thus far shalt thou come and no farther."

New Speedometer.

To count the number of revolutions made by a wheel or revolving shaft, or count the number of strokes of an engine, is apparently a very simple thing, but it has been found that when the speed is much above one hundred it becomes difficult, in all cases, to count accurately. Many persons, however, can count up above two hundred per minute, but we think that very little reliance is placed upon the counting when there are more than two hundred revolutions per minute to be noted, different persons differing very widely in their estimate of what the speed really is.

Speed indicators, as usually constructed, are rather expensive, and unless a person has particular need for one he would hardly feel like paying the $6 or more usually charged for them. As commonly constructed, they are arranged with several indicators, so as to count revolutions up to a thousand or more. The little in-



strument which we illustrate, manufactured by E. H. Jacobs & Co., West Killingly, Ct., while practically answering every requirement of a speed indicator, is so simple that its cost is very much less than that of the more complex instruments. Its construction is almost too simple to need any description. An endless screw on the shaft, shown at the bottom of the instrument, engages in the teeth of the dial wheel. Every revolution of this shaft moves the wheel one notch or tooth. The face of the wheel is graduated so that when the wheel is moved the hand indicates the number of revolutions.

The face of the index wheel is graduated up to one hundred, the person using the shaft being expected to count the hundreds of revolutions. The instrument is furnished with two points for hollow or pointed center marks. It is nickel plated, and seems to be what is claimed for it by its manufacturers, "accurate and reliable."

Late Discoveries in Metal Working, &c

(*Unsere Zeit.*)

Incrustated Bronzes.—These bronzes, recently introduced by the manufacturers, Messrs. Christofle & Co., of Paris, have called a good deal of attention on account of their attractive forms. The articles of domestic use and luxury made by the firm consist of copper or bronze ware, with silver and gold ornaments. The latter appear either in lines or patches, and remind us of Niello work, but while by the last named method the precious metals are bodily incrustated, the Christofle ornamentation is brought about by a galvanic process. The design is etched into the metal by means of dilute sulphuric acid, and filled again in a gold or silver bath through the instrumentality of a galvanic current. After polishing the articles, their bronzing is proceeded with, which in no wise changes the outward appearance of the gold or silver. A remarkably fine effect is attained by bronzing black, by means of sulphuret of copper, portions of the articles between the silver ornaments, forming a pleasant contrast of white and black on the copper or bronze ground tint. Although as yet expensive, these bronzes are a good deal cheaper than those incrustated after the Niello fashion. Great manual skill is required in the manufacture of these bronzes upon the new plan, but the outlay for material, etc., is inexpensive. To perfect this new method seems worthy the efforts of metal workers.

Steel Bronze.—This composition is intended to take the place of cast steel as a material for cannon. After a great many perilous experiments the Austrian General von Uchatius has succeeded in perfecting the composition. A good deal of experimenting of a similar kind had been going on for some time past; thus the compression of bronze in Russia, the casting of it into thick iron shells (*coquilles*) by Lavessiere in France, who made a superior bronze, but none coming fully up to cast steel. Uchatius then successfully made the attempt of rolling "coquille" bronze when cold. When rolled out 20 per cent. these bronzes still showed all the qualities of steel. A remarkable discovery was made on the occasion, the one that the elasticity of the tough metal increases after the strain put on it passes the limits of elasticity heretofore laid down for it. The best composition proved to be 8 per cent. tin and 92 per cent. copper. The cannon made of steel bronze fully answers the purposes for which it is intended, *i. e.*, its capacity of resistance is as great as that of cast steel, and is accepted as its worthy compeer. Aside from this it has the superior advantage of being less subjected to wear from atmospheric influences than the steel gun, and that its intrinsic metal value remains pretty much the same it originally possessed. Hence steel bronze is viewed as promising a great future in gun manufacture.

Vavin's Apparatus for Separating Metals.—In machine and metal workshops the separating of iron file dust from that of copper and brass has hitherto been done by hand, a kind of work not only laborious and unreliable, but injurious to health. The Vavin apparatus performs this task electro-magnetically. The metal file dust is cast upon two cylinders revolving above each other in the same direction, coated with stripes of soft iron, which are kept in a continually magnetic state by means of magnets brought into connection. The iron file dust is thus made to adhere to the surface of the cylinders, and, while turning, simultaneously revolving brushes remove it, and cause it to drop into a receptacle, while the particles of copper drop below the apparatus, which, despite its diminutive proportions, is capable of separating 1100 pounds of metal file dust to the hour. The apparatus is also calculated to perform important services in geological researches and metallurgical labors. Herve Mangon has successfully employed it in discovering titaniferous iron in common soil, separating 1½ grains of such iron from 220 pounds of earth in a comparatively short time, which would have involved a great deal of trouble by any other known method.

Fire Proof Powder Safes.—Many accidents occurring in quick succession have led to their construction. They are similar to ordinary fire and burglar proof safes, but have plain locks. Their walls are of uncommon strength, and consist of four inch chambers, filled with a mixture of saw dust and alum. The latter contains 42 per cent. water, which evaporates the moment it is heated to a melting point; the vapor thus produced penetrates into the interior of the safe through thin apertures, moistens the powder and thus prevents explosion. The English government caused four safes thus furnished, and each containing different quantities of powder, to be subjected to an intense heat during six hours in a furnace, and 210° F. left the powder in a state of perfect preservation, while the safes were also well conditioned when removed.

The Podometer.—There has been invented a little apparatus for measuring the steps of persons walking, and the distance made by them. The podometer is of the size of an ordinary watch, and is attached to a button hole of the pedestrian. Its mechanism is simple in the extreme. The dial in divided into 12 kilometers, and an index revolves within its circle. A little horizontally inserted hammer rises and inclines with every step, while a spring restores it to its former position. Its movements drive a toothed wheel, which again moves a clockwork, and through it the index. The deviations do not exceed 60 meters to the kilometer. The apparatus should not be looked upon as a mere toy, inasmuch as it is useful in determining approximate distances made by soldiers and engineers, especially also the quickness with which troops have performed marches. The common step measures 65 centimeters, while the marching regulations of the French army prescribe 110 such steps to the minute.

An Apparatus for Preventing the Freezing of Water.—The bursting of water pipes is prevented by means of an apparatus made under the *common* patent by Whitley Partners, of Leeds. A box of thin sheet copper is placed outside the building whose pipe is to be protected, filled with water and exposed to the freezing point in the open air. The moment the water freezes the expansion of the box exercises a pressure, and opens the valve attached to it, which causes the main pipe to open and discharge its contents. The water in motion produces a counter pressure and closes the valve, thus restoring it to its functions. The apparatus is made under three species of modifications, one applicable to buildings furnished with cisterns, and two where there is direct pressure.

Lead Poisoning through Lead Pipe.—Recent investigations have sufficiently proved that the conveyance of the poisonous substance in lead through water pipe is only to be apprehended where rain water has been allowed to remain for some time in a lead cistern. According to Fordos, there is a great deal more danger of deleterious effects from cleaning bottles with shot, by the contact in which particles of lead in the shape of shot are apt to remain with wine, while clinging to the bottom of bottles; soluble lead salts are generated, which, in their turn, are introduced into our organism, and gradually bring about what is called lead intoxication. The composition in which tin and lead are used for lining kitchen and apothecary's utensils may also produce lead poisoning, if it remain for some time in contact with wine, milk or acidulous water, since easily soluble lead salts are generated, thereby destructive to health. At Paris, attacks like those of cholera have frequently been observed consequent upon the partaking of ice cream. The latter had been made, according to an investigation instituted, in vessels lined with a composition of tin and lead. The chemist Peligot advises the discarding of such composition altogether, and to substitute for it britannia metal, which is composed of 90 per cent. tin, from 8 to 10 per cent. antimony and one-half per cent. copper, which remains unaffected by the usual liquids that are used for the preparation of viands, and which even a dilute solution of sulphuric acid does not attack.

Iron Shipbuilding on the Mississippi.

The St. Lou's *Globe*, of April 11, says:

It is generally known that the Western Iron Boat Building Company was organized in this city last fall, and their yard established just above the Carondelet docks. Yesterday the first steamer built by them was successfully launched. The boat was built for the U. S. Engineer Service, and is intended for a snag boat. Her hull is made of iron from the foundry of Chouteau, Harrison & Valle, and is one hundred and thirty feet long, thirty-six feet beam, five feet hold. She has two engines, built by Collins & Holliday. Her cylinders are 12 inches, with 5 feet stroke, with doctor and 2 capstan engines, with power sufficient to raise 2 tons each; boiler, 44 inches, 22 feet length; steam crane on forecastle—the plan by Major Sutter, of the Engineer department. She is furnished with a neat cabin and outfit. Anchors, chain and iron work by P. P. Manlin. At 2 o'clock, p. m., she was placed in the cradles of Mr. David Cambell's Carondelet Ways, and shortly afterward the clock-work machinery of these great ways was set in motion, and she was launched at 4 p. m. She struck the water, and as she touched it, Mr. David R. Risley broke a bottle of Imperial over the bitts and named her the O. G. Wagner, amid the cheers of the assembled guests. A fine lunch was provided for the invited guests in the cabin of the boat. Speeches and toasts were in order until 5 o'clock. It is proper to state also that there was not a leak in the hull, and that she is one of the lightest boats of her size ever built, her draught averaging only 11½ inches.

The Adirondac Steel Works.

The oldest establishment in this country engaged in the manufacture of cast steel of every description, and prominent among the very largest, is the Adirondac Steel Manufacturing Company, of Jersey City, the proprietors being Messrs Gregory & Co. Its business was established over 27 years ago (in 1848), under the name of the Adirondac Steel Works, the late Mr. D. S. Gregory being one of the partners in the concern, with whose growth and prosperity his name was identified for more than a quarter of a century. Since 1863 the firm name has been Gregory & Co. Owing to the decease of the senior partner, December 8, 1874, the establishment has passed into the hands of his four sons, Benjamin, the managing partner, Dudley S., Chas. E., and David H. Gregory, the business still continuing under the well known name of Gregory & Co. Mr. H. J. Hopper, who has been connected with the house during the last twelve years, still remaining as manager.

The location of these extensive steel works has always been the same, and the grounds, now bounded by Warren and Bergen streets, and the Cove, in Jersey City, comprise 37½ city lots, or a total area of 93,750 square feet. The main works are substantially built of brick, and cover 14 lots, affording the unusually large area of 35,000 square feet of working space, under one roof.

The principal departments are the hammer shop, the melting house, the rolling mill, and the forging shop, all sections being methodically arranged for the convenience of the workmen, and completely equipped with the latest improved tools, machinery, fixtures and appliances pertaining to the manufacture of cast steel in all the leading branches, some of the most prominent being agricultural steel, railroad steel, cutlery steel, gun steel, machinery steel, hammer steel, etc., etc. The average number of expert workmen employed is about 75 in all departments, and the aid of the ponderous machinery they now turn out from six to eight tons of finished cast steel per day, the pay roll amounting to $1600 per week.

Steam-power is furnished by three engines of 20, 100 and 150 horse-power respectively, five boilers of 40 horse-power each, and a flue boiler of 150 horse-power. The establishment is also provided with three trains of rolls, three steam hammers and two trip hammers. From 2000 to 2500 tons of iron are used per annum, the principal kinds being Swedish and Lake Champlain iron. The amount of coal consumed here in a year ranges from 7000 to 8000 tons.

Some idea of the extent of the market for cast steel in this country may be gathered from the fact that engaged in the manufacture of American cutlery there are over 80 establishments, using materials annually amounting to about $800,000; agricultural implements, over 2000 establishments, annual cost of materials over $21,000,000, and in machinery of all kinds about 29,000 establishments, annually consuming about $60,000,000 worth of materials; independent of the numerous other manufactures in which cast steel is extensively used.

The various descriptions of cast steel produced at the works of the Adirondac Steel Manufacturing Company are largely shipped throughout the United States and Canada, and have acquired a repute for excellence as high as the highest in this country or in Europe. Owing to the rapid growth of our population and the extent of contemplated improvements in all directions, the demand for both steel and iron will probably soon require all the energy and enterprise of both manufacturers and dealers and all the vast natural resources at their command, to keep pace with the requirements of the country.—*Bulletin I. and S. Association.*

Molded Cast Steel.

The Louisville *Manufacturers and Merchants Advertiser* says:

Last week, while visiting the plow factory of Brinley, Miles & Hardy, we had an opportunity of seeing one of the castings of the Pittsburgh Steel Casting Company worked in the forge. When heated and drawn out on the anvil it exhibited almost as much ductility as common wrought iron, being easily drawn out and worked into any desired shape, while at the same time it admitted of the highest tempering. The castings we saw were close-grained, of superior strength, no doubt capable of high polish and not porous as cast steel castings ordinarily are.

The Pittsburgh Steel Casting Company started in a modest way three years ago to operate their patent method of making castings of cast steel, not of cast iron with a certain similarity to cast steel, nor a semi-wrought iron with something of a steely texture and brittleness, but genuine fine-grained crucible steel, capable of hardening, forging and temper-drawing, and which would make castings as fine as almost any material that is run into molds. That they have been successful in this the surprisingly rapid extension of their business is of itself sufficient to demonstrate. We learn that they have now nineteen smelting holes, one Siemens pot furnace, gas furnace also, and a capacity of eleven tons per day, which they find it necessary to increase.

To no branch of a manufacturing business has the success of the patented method of the Pittsburgh Steel Casting Company been so advantageous as that of agricultural implements. The makers of this class of goods had wants so innumerable and peculiar, that to have their multitudinous shapes made out of steel, and cast steel at that, so increased the value of the articles made, and gave such an impetus to their business as to be a matter of wonder. Parts that had been previously made by the expensive method of forging was displayed by steel cast more accurately to size and shape, and of greatly increased strength and durability. Again, other parts that had been made of cast iron are realized to be cumbersomely heavy when it is found that steel castings of one-fourth the weight have more than equal strength. Still again other articles that had been forged from wrought iron or steel are no longer made in that manner, for the sole reason that the steel castings are cheaper.

We understand that our friends, Brinly, Miles & Hardy, have for some time been using these castings in their well known plow factory, and have reason to be thoroughly satisfied with their excellence and durability. For sandy soil and the black sticky lands this steel they consider invaluable, as it requires a close-grained and hard steel to give the sticky land no chance to adhere to the metal, and in sandy soils, which quickly cut out common steel, these molded cast steel points wear admirably. The firm continues, as before, to make the wrought steel points, but are so convinced of the desirability of the molded steel that they have extensively recommended it and secured for it a satisfactory trial among their numerous customers.

During our visit to the factory we learned that the increasing demand for the Brinly plow is tasking the capabilities of the establishment to the utmost, and that it will be necessary to enlarge the manufacturing facilities before another year to provide for the requirements of the business.

German Kitchens.

The German kitchen, with its furniture or lack of furniture, and the operations conducted in it, are thus described in *Fraser's Magazine:*

The kitchen is a small bare room, with a brick or concrete floor; no oil cloth, no cocoanut matting, no carpet, no pretense to comfort. You wonder how all the routine of cookery and scullery can be carried on in it. The copper pans on shelf and peg shine warm and bright from the walls, the window is clean, and buckets full of water, with a large brass water scoop, show that all is ready for the day's operations. The mere cooking is far more easily accomplished in a German than in an English household. The hot metal plates, provided with numerous circular holes into which rings can be fitted or from which they can be hooked out, to suit the exigencies of the various pots and pans, accommodate any number of kettles or stew pans. These stand simmering, boiling, or stewing, according to their position, and are plunged into the circular holes by which they come nearer to the fire when accelerated speed is desireable. The servant has here again a vast amount of labor saved her; not only that she has no hearth stoning, fender-polishing, or black-leading to accomplish, but that she can get at all her *plats* readily without burning her face and hands or straining her muscles as with us, by stretching over a wide hearth in front of a scorching fire, to the detriment alike of her clothes, health and temper. I may mention that drunkenness is quite unknown among female servants in Germany, and one cannot help feeling that a great deal has been done for them by this contrivance of the hot metal plates.

Knowing the value of fuel, and the extreme frugality which is observed in all households as to this most expensive item of domestic economy, a German servant will give you no trouble in the matter. Having heated water for your early coffee (a mere handful of firing has been necessary for this), she allows the flame to die out. She will draw the few living embers to the mouth of the grating in the hot-plate, and lay a piece of peat upon them before she goes out to market. When she returns, a few puffs of breath blow the smoldering heap into life, and her saucepans will soon be boiling in merry concert. The moment dinner is over she will fill every available vessel with water, so that she has a supply sufficiently warm to wash up with, and the fire again dies down. It has to be lighted for supper, but the same frugal rule is observed, and as the hot plate affords no warmth beyond that immediately beneath the saucepans, there is no temptation to make a larger fire; nor do I remember, in a single instance, having had to remonstrate as to waste of fuel.

Co-operative Iron Works.

The *Pittsburgh Commercial* thinks that the reported movement on the part of some of the puddlers and other iron workers to lease one or more of the idle rolling mills, and try what they can do toward solving the differences between them and capitalists is an encouraging sign. The efforts to found co-operative societies in the neighborhood of Pittsburgh have not heretofore been very successful, numerous attempts having been made by the glass blowers, resulting, in nearly every case, in failure, principally we believe from the lack of business experience. Very few such societies have the pecuniary strength to carry out their undertakings without borrowing, and when once launched on the uncertain sea of credit, their want of knowledge of commercial usage and their known lack of capital operates unfavorably. The experience bought by such failures should have the effect of making new aspirants sufficiently cautious in their management to avoid the errors of the past.

There is no good reason why a combination of skilled workmen should not succeed in the manufacture of iron, as they have succeeded in other branches of manufactures.

Robert Dale Owen, in his autobiography, gives an interesting account of the principle of co-operation as put in practice by his father in his works at New Lanack, and afterward at Harmony, Indiana, where he purchased an extensive property from the Economites.

The apostle of co-operation in France was Louis Blanc, yet his central idea was rather governmental supervision and regulation than simple co-operation of individuals. A scheme that must necessarily have failed, as corruption and mismanagement sooner or later developes itself in all undertakings conducted by a government.

It is in Great Britain that co-operative societies have been the most successful. It was there that the celebrated Rochdale Pioneer's Society was founded by seventeen weavers, with a total capital of $140, from which has grown a successful business of large proportions. At the present time their capital is reported to be over $650,000, of which $230,000 is used as a working capital, $100,000 being represented by permanent investments, and the remainder is invested in shares of or loans to other societies of a similar nature. Three years ago it had nearly 6500 members, and its gross business for the year was over $2,300,000, and it paid the members a cash dividend of 12 per cent. The latest reports of all the societies of this nature in Great Britain show that they own in property and stock $5,932,820, and have a capital stock of $11,529,755. The net profits for the year were $3,350,000, and the number of members 262,188.

The ultimate possibilities of intelligent co-operation are almost unlimited, and if the present troubles between the working men and the mill owners result in the successful application of the principle of co-operation, the lock-out will not have been without some good results.

In Paris, the watchmen in all magazines where inflammable or explosive materials are stored, use, for purposes of illumination, a light provided according to the following method: Take an oblong vial of the cleanest glass; put into it a piece of phosphorus about the size of a pea, upon which pour some olive oil heated to the boiling point, filling the vial about one-third full, and then close the vial with a tight cork. To use it, remove the cork, and allow the air to enter the vial, and then recork it. The whole empty space in the bottle will then become luminous, and the light obtained will be equal to that of a lamp. As soon as the light grows weak, its power can be increased by opening the vial and allowing a fresh supply of air to enter. In winter it is sometimes necessary to heat the vial between the hands to increase the fluidity of the oil. Thus prepared, the vial may be used for six months.

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STEEL CASTINGS,
Solid and Homogeneous, guaranteed to stand a Tensile Strain of 25 tons per square inch. An invaluable substitute for expensive **WROUGHT IRON FORGINGS** or for Iron Castings, where great strength is required. Office, **cor. Evelina and Levant Sts., PHILADELPHIA.**
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Charcoal Blast Furnaces.

Having during the past 10 years constructed and put in operation a number of the most successful Charcoal Blast Furnaces in the country, and having a competent corps of workman constantly in my employ, I am enabled to offer advantages in constructing or remodeling upon the latest and most approved plans.
Examinations of Furnace Property made and reported upon when solicited. Correspondence promptly attended to.
J. M. WHITE, Engineer,
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The **TRENTON VISE & TOOL WORKS**, Trenton, N. J., having increased their facilities, are now able to do all kinds of
Iron and Steel Drop Forgings
in quantities to order at reasonable rates.
HERMANN BOKER & CO., Proprietors,
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Merchant Iron or Nails

Wanted in exchange for 300 tons No. 1 Wrought Scrap Iron.
GILCHRIST & GRIFFITH,
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TO LET,

The Light, Handsome Office
Now Occupied by MESSRS. HEATON & DENCKLA.
Possession immediately.
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Scrap Iron & Metals, Machinery, Tools, Shafting & Pulleys, Steam Engines, Pumps & Boilers, Copper, Brass, Tin, Babbit Metals, Foundry Facings. Best Quality Ingot Brass.
Cash paid for allkinds of **Metals** and **Tools.**

Wanted,

A situation as bookkeeper or cashier of an iron works, a hardware business, or in the coal trade, which the advertiser understands in all its branches. Highest references of character, capacity, &c.
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DEEP RIVER, Conn., Sept. 7, 1874.

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Pure Metallic Iron		57·48
Oxygen with the Iron		21·90
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Insoluble silicious matter (white sand)		15·19
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Sulphur		·02
Phosphoric Acid—Phosphorus	·42	
—Oxygen	·54	·96
Alumina		·28
Lime		1·59
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A merchant in Iron and Steel and Wagon materials, established 15 years in New York city, doing a large and profitable business, desires $15,000 Special Capital to enable him to buy for cash. Would prefer making an arrangement with some established Iron house or Rolling Mill, as I have a yearly sale of $60,000 Manufactured Iron, in small lots, at good prices. Address,
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Will sell their Foundry, with all its appurtenances, business and good will, upon very liberal and accommodating terms, offering to any party wishing to engage in the Stove or general Foundry Business a rare opportunity.
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Surveys Made and Titles Investigated. Parties desiring information or wishing to purchase ore or coal lands within the States of Tennessee, Alabama or Georgia, are respectfully requested to communicate.

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Two of the
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Also, 6400 Acres Bituminous Coal Lands, for which part payment will be taken in Northern Pacific R. R. Bonds.

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For Sale,

Stove and Tin Business.
Will sell, on good terms, one of the best arranged House Furnishing Stores in Canada West, at St. Thomas. The premises are roomy, the buildings having been arranged especially for this trade, with Tinsmith's workshops and benches complete for 12 men.

Present Stock about $6000.

St. Thomas is the head quarters of the Canadian Southern Railway Co. To a practical, energetic man this offers unusual advantages. Business well established and with good connection. Reason for disposal, present proprietors increasing their wholesale and retail Hardware Store next door to the above premises. Address
HORSMAN & HORSMAN,
Iron and Hardware Merchants,
St. Thomas, Canada West.

FOR SALE,

at 10c. a copy, general ***Spanish Weekly Market Review.*** written and published by the subscriber. 22 April, 1875, number 186, circulating in Mexico, the West Indies, Central and South America, including Brazil, Spain and Manila, on which certain standard articles of American manufacture are quoted. The undersigned is also
Translator for Manufacturers and Land Companies,
from and into the
ENGLISH,
SPANISH,
FRENCH,
and GERMAN.
Spanish Catalogues got up correctly and with despatch. Address, **C. KIRCHHOFF,**
Metal Reporter of "The Iron Age,"
Box 2806, N. Y.

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, April 21, 1875.

The past week has been characterized in Wall street chiefly by a relapse of the several financial markets into the dullness which, with the exception of a brief interval of speculative activity, has prevailed for several months past. The general markets have also lacked the activity which should be noticeable at this time of the year, owing, doubtless, to the unusual backwardness of the season. The money market continues very easy. Borrowers on call have been accommodated at 2½ @ 4½ per cent., and prime mercantile paper has been in very good demand at 6½ per cent.

The gold market has been unusually steady throughout the week, with a good demand for, and a plentiful supply of, cash gold for borrowing. The following table shows the daily range of the premium, which has fluctuated within narrow limits:

	Highest.	Lowest.
Thursday	115⅛	115⅛
Friday	115⅛	115
Saturday	115⅛	115
Monday	115⅛	115
Tuesday	115⅜	115
Wednesday	115⅛	114⅞

Government bonds continue strong and steady. The Treasury decision that currency sixes may be used as pledges for national bank circulation has made these bonds the feature of the market. On Tuesday the Secretary issued another call for $5,000,000 five-twenty coupon bonds, and also gave notice that the payment of the May interest would begin to-day.

Railway mortgages are strong, with an active investment demand for those of paying roads. We give below the closing quotations of governments.

The stock market has been without interest, and the changes in quotations have been unimportant. The principal dealings have been in Lake Shore, Union Pacific, Erie, Western Union, Pacific Mail, and Northwest. We give below the highest and lowest of to-day's quotations.

The bank statement shows a gain in total reserve of $1,358,800, and the banks now hold $9,701,475 surplus reserve against $8,970,975 last week. The gain in legal-tenders is not as large as expected, but as it is a rising average the banks hold more than from the statement they appear to. The change in the deposit items indicates the return to the city of over a million National bank notes in addition to what legal-tender notes have been received here during the week. The following is a comparison of the averages for the past two weeks:

	April 10.	April 17.	Differences.
Loans	$278,262,800	$277,964,500	Dec. $ 298,700
Specie	14,524,500	14,013,200	Inc. 511,300
Leg. Ten.	48,419,900	50,290,000	Dec. 1,870,100
Deposits	215,893,700	218,406,900	Inc. 2,513,200
Circulation	21,506,800	21,332,800	Inc. 104,000

The following tables show the movements for the week in foreign trade:

IMPORTS.

	1873.	1874.	1875.
Total for week	$12,346,614	$9,269,815	$6,117,777
Prev. reported	127,179,971	121,674,492	105,876,297
Since Jan. 1	$139,526,585	$130,944,307	$111,994,074

Among the imports of general merchandise were goods valued as follows:

	Quant.	Value.
Anvils	83	830
Brass goods	10	881
Bronzes	41	8,563
Copper		582
Cutlery	86	31,361
Gas fixtures	4	1,188
Guns	189	14,783
Hardware	51	6,564
Iron, pig, tons	598	12,996
Iron, sheet, tons	5	575
Iron cotton ties	1,428	4,441
Iron, other, tons	118	7,749
Iron ore, tons	246	8,221
Nails	67	1,854
Metal goods	189	17,821
Lead, pigs	835	5,688
Needles	14	9,645
Per. caps	23	4,154
Saddlery	11	2,640
Steel	1,753	30,471
Silverware	4	391
Tin, boxes	33,034	273,121
Tin, 29 slabs	11,142	2,300
Wire	342	4,480
Zinc	377,230	23,492

EXPORTS, EXCLUSIVE OF SPECIE.

	1873.	1874.	1875.
For the week	$6,947,560	$4,309,253	$6,616,840
Prev. reported	74,820,296	78,904,468	66,752,418
Since Jan. 1	$81,767,856	$83,213,721	$73,369,258

EXPORTS OF SPECIE.

Total for the week	$849,075
Previously reported	16,816,273
Total since January 1, 1875	$17,665,348
Same time in 1874	9,549,661
Same time in 1873	16,521,501

Government bonds at the close were quoted as follows:

	Bid.	Asked.
U. S. Currency 6's	194½	125¾
U. S. 6s 1881, reg.	121½	122
U. S. 6s, 1881, cou.	122¾	123
U. S. 1862, 5-20 reg.	116¼	—
U. S. 5-20 1862, cou.	118¼	119
U. S. 5-20 1864, reg.	117½	117¾
U. S. 5-20 1864, cou.	120¾	120¾
U. S. 5-20 1865, reg.	118¾	118¾
U. S. 5-20 1865, cou.	122¾	122¾
U. S. 5-20 1865, reg. new	120¾	121
U. S. 5-20 1865, cou.	121	121¼
U. S. 5-20 1867, reg.	121¾	121¾
U. S. 5-20 1867, cou.	121¾	122
U. S. 5-20 1868, reg.	121¾	122
U. S. 5-20 1868, cou.	121¾	122
U. S. 10-40 reg.	115¾	115¾
U. S. 10-40 cou.	116¾	117
U. S. 5s, 1881, reg.	115	115¼
U. S. 5s, 1881, cou.	116¼	116¾

The following were the highest and lowest prices of stocks to-day:

	Highest.	Lowest.
N. Y. Cen. & Hudson Consolidated	102¾	102
Lake Shore	72¾	71¾
Rock Island	103¾	103¾
New Jersey Central	113	113
Delaware, Lackawanna & Western	115¾	115¾
Wabash	16¾	15¾
Harlem	131	131
Western Union Telegraph	77¼	77¾
Atlantic and Pacific Telegraph	27	26
Northwestern	43¾	42¾
" Pref.	55¾	55¾
Milwaukee & St. Paul	87¾	87¾
Panama	141	139
Pacific Mail	45½	44¾
Erie	31¾	31
Ohio & Mississippi	27¾	26¾
Union Pacific	74¾	73¾
Kansas Pacific	26¾	23
do Preferred	34	34
Atlantic & Pacific Preferred	14¾	14¾

	Highest.	Lowest.
C., C. & Ind. Cen.	6	6
Hannibal and St. Joseph	25¾	25¾
New Jersey Southern	7	6⅞
Quicksilver	20¾	20¾
" Pref.	29¾	29¾

GENERAL HARDWARE.

There is very little of importance to be noted in the Hardware market this week. A good deal of business is being transacted, and the same absence of country buyers which we have noticed for several weeks, continues; letter orders are, however, abundant and satisfactory, and several manufacturers of specialties are behind their orders, and are pressing their works to their utmost capacity. This state of affairs is, however, not by any means general. With regard to prices, very few changes have been made, and the market is, as a rule, a firm one.

Trade in Foreign Hardware is generally reported active, and prices are firm, with an upward tendency in heavy goods. No changes in prices are reported, and stocks of both English and German goods are fairly assorted.

There continues to be a good demand for Nails, although this branch of trade is not as active as at our last writing. The stocks of Nails in this city are, as a rule, well assorted. All of the New England Nail Mills are shut down for the present, and any marked increase of activity in the demand for these goods would have the effect of breaking assortments badly. In regard to price there is no change to notice, and we continue to quote 10d., in lots of 200 kegs and over, at $3·35, net, at which price the tone of the market is firm. Small lots are quoted at $3·35 @ $3·40.

The manufacturers of Iron Wire have again advanced the price of Bright and Annealed, Coppered, Fence and Grape Wire. The following revised discounts take effect on Thursday, 22d instant. The price of Fence Staples have also been advanced to 8c. @ 8½c. per pound, formerly 7½c. @ 8c.

IRON WIRE.

	Discount per cent.
Bright and Annealed, Nos. 0 to 18	40@45
" " Nos. 19 to 26	47½@52½
" " Nos. 27 to 36	52½@57½
Coppered, Nos. 0 to 18	35@40
Annealed Fence, Nos. 8 and 9	40@45
" Grape, Nos. 10 to 14	40@45

E. Andrews, Williamsport, Pa., has issued the following list for his new Patent Hand Saws, which is subject to discount 10 per cent.:

18 inch	per doz.,	$18·50
20 "	"	20·50
26 "	"	24·50
28 "	"	29·00
30 "	"	32·00

An illustration and description of these goods will be found on page 11.

The Racine Hardware Manufacturing Company have added to their line of Hardware specialties French Bronzed Butts, which will compare favorably, both as regards strength and finish, with any similar goods in the market. A stock of these goods will be found at the wareroom of their agent, G. Webster Peck, No. 110 Chambers street, which he offers to the trade at the following list, less discount 20 per cent.:

FRENCH BRONZED BUTTS.
(Per dozen pairs.)

3½x3½	4x4	4x5	4½x4½	5x5	5x6	5x7
$10·00	12·50	15·00	15·00	17·05	18·50	22·50

These goods are put up in paper boxes, one pair in a box. We invite the attention of the trade to the advertisement of these and other specialties on the 2d page.

W. S. Hammond, Lewisberry, Pa., quotes Hammond's Window Sash Springs discount 25 per cent., formerly discount 35 per cent.

The Corrugated Metal Company, East Berlin, Conn., have issued the following list for the Champion Ash Can. These goods are very strong and durable, being corrugated throughout. They are manufactured under Towner's patent, issued June 23, 1874.

THE CHAMPION ASH CAN.

Sizes.	Made of Black Iron and Japanned.	Made of Galvanized Iron.	Made of Black Iron, Galvanized after being made. Is Water Tight	Sifters with Covers	Covers for Cans.
No. 1, 14 x18	$2·25	$3·00	$2·50	$2·00	35 cts.
No. 2, 16 x20	3·00	4·00	4·50	2·50	40 cts.
No. 3, 17½x22	4·00	5·00	5·50	3·00	45 cts
No. 4, 19 x24	5·00	6·00	6·50	3·50	50 cts.

The above list is subject to discount 25 per cent. to the trade. The manufacturers claim for this Barrel, or Can, that it is the best and cheapest receptacle for ashes and garbage ever placed upon the market. The following description we take from their circular:

The corrugations are not mere slight impressions stamped in the metal; but the material is corrugated throughout, and the bands are corrugated to correspond with the body of the Can. The bottoms are turned down and secured between double corrugated bands, making four thicknesses of Iron and a wide flange, which effectually protects the bottom, and prevents it from coming in contact with the ground. The top is strengthened by an oval band, also corrugated, and the best material only is used in their manufacture—making a Can that will bear more rough usage than anything of the kind heretofore made. We make four sizes, and three kinds of each size, as shown; and also manufacture and furnish with them our Improved Ash Sifter, which is very simple, and has no superior. We furnish covers, if wanted; also, bails instead of handles for the smaller sizes.

G. B. Walbridge & Co. are issuing the following price list for the "Universal Family Dial Scale," which is subject to a discount of 20 per cent. These goods are warranted to be correct, and are packed one scale in a case:

No. 1, weighing 12 lbs.			$48 00	per doz.
No. 2, " 24 "			60·00	"
No. 3, " 48 "			72·00	"
No. 1, " 12 "	with 12 in. Tin Scoop,		52·50	"
No. 2, " 24 "	" 15 "		65·50	"
No. 3, " 48 "	" 18 "		78·50	"

No charge for packages.

Quackenbush, Townsend & Co., No. 59 and 61 Reade street, are proprietors and sole manufacturers of the Challenge Door and Gate Springs. They quote these goods at the following figures:

No.	9	7	6
Per dozen	$4·00	5·00	6·00

less discount 40 per cent. For the other specialties represented by this house we refer our readers to their advertisement on page 18.

John Chatillon & Sons Nos. 91 and 93 Cliff street, quote their Spring Balances at discount 30 per cent. and Chatillon's "Eureka" Scales, discount 20 per cent., formerly discount 25 per cent.

Graham, Emlen & Passmore, No. 631 Market street, Philadelphia, illustrate "The Philadelphia Lawn Mower" in their advertisement on page 24. This machine has been extensively introduced in the State of Pennsylvania, where, we are informed, it has given good satisfaction, over 28,000 being in use.

J. Clark, Wilson & Co. desire the attention of dealers to their large assortment of Pocket Knives manufactured by Miller Bros. Cutlery Company, for whom they are agents. These goods are well finished, and warranted by the manufacturers to be equal to any similar goods of either foreign or domestic manufacture. They are offered to the trade at discount 25 per cent. from their list. They illustrate some new patterns of these goods in their advertisement on page 18.

BRITISH IRON MARKET.

(Specially reported by cable for The Iron Age.

WEDNESDAY, April 21, 1875.

Scotch Pig.—A large business is doing under a steady demand, but no improvement is to be noted in prices, which continue weak. The following are makers' quotations:

Gartsherrie No. 1	75/6
Coltness No. 1	77/
Glengarnock No. 1	74/
Eglinton No. 1	69/

Manufactured Iron and Rails remain without change.

IRON.

American Pig.—The market seems to be characterized by even greater stagnation this week than last, and the feeling of the trade is less hopeful. The lateness of the season is discouraging, and there seems little prospect of improvement in the near future. Consumers are only buying in small quantities to meet their immediate requirements, which are now light, and dealers are universally refusing to buy anything except as their trade calls for it. Neither class of buyers manifest any disposition to speculate. In the Lehigh region furnaces are now able to get a fair quality of coal, though at prices higher than they paid before the strike. We hear of no transactions of any amount, and prices are without change. We quote Foundry No. 1, $28; Foundry No. 2, $26; and Gray Forge, $24 @ $26.

Scotch Pig.—Since our last there have been some arrivals, of which part has been put in store, while about 400 tons have been sold from ship at prices below our quotations, and at a loss to the importers. We quote $36 for Coltness, $36·50 for Glengarnock, and $33 for Eglinton, but lots forced on the market do not bring these prices.

Scrap.—The stock is still small and held by strong parties. There has been some inquiry, but little business. We continue our quotation of $35 @ $37.

Rails.—There is still a good deal of inquiry and little business that can be reported, although there are numerous rumors of sales which we can not authenticate. We quote $48 @ $53 at mill for American.

Old Rails.—There is still little or no demand, and a small lot has been offered at less than our quotations, without takers. We quote nominally $29 @ $30.

METALS.

Copper.—There has been but a moderate amount of business transacted during the week, the dealings having been more exclusively of a jobbing character, and the only larger lot we can trace to a reliable source as actually sold has been one of 30,000 pounds Lake at 22½c., cash, at which the market closes with considerable firmness, very little offering either on the spot or to arrive. Baltimore, in a small way, is quoted at the same figure. No later cable reports have come to hand from London, but we have the mail accounts to the 10th instant, to the following effect: "On the 7th instant the Chili telegram came to hand with charters for the last half of March of 1700 tons, the fifth consecutive advice under 1800 tons, which seems to have imparted additional strength to the article. The requirements for the India market seem to be supplied for the moment, and orders for shipment are not so numerous, nor of sufficient importance to impart stability to prices, but the home demand is fair, and the inquiry for Chili Bars is based not upon any speculative movement, but upon the requirements of consumers. This is a good sign, and should it continue, speculation is pretty sure to afford additional support to the market. The statement of exports and imports for the quarter ending March 31, shows that 10,000 tons more Copper were imported than exported during that period, and as in the same time our public stocks in England only increased 4000 tons, and it is generally understood that consumers in Birmingham and elsewhere are rather bare of Copper than otherwise, it would appear that home consumption has been very good since the commencement of the present year." The foregoing fully explains the steadiness in Chili Bars at £81 @ £81. 10/. New Sheathing is steady at 28c.; Bolts and Braziers at 30c.; Bronze and Yellow Metal Sheathing at 21c., and Yellow Metal Bolts at 28c., net cash.

Tin.—Early in the week Singapore quoted Malacca Tin $23 per picul, while it is cabled thence to-day $23·25; London then wired £86, Straits, and £91, Common English, while to-day the market there is down to £85 for the former, or but £1 above the lowest previous figure since January 1. Although the Straits shipments to Europe have been unusually large, we incline to the belief that accounts from Australia are at the bottom of this constantly recurring weakness at London. The reports from the British East Indies are, on the contrary, better; thus the latest Penang advices, dated March 12, just to hand, contain the following passage: "The supplies from Junk Ceylon and Larote have been exceedingly small, the production being curtailed, owing to the want of rain, and also to the low price now current here." An additional cable dispatch from London, of to-day, also expresses itself to the same effect. The same mail brings particulars of shipments made from the Straits to America in January and February, having been 17,911 piculs against 8,892, 5,877, 9·048, 7,226, and 2,155 in 1874–'70. While the stock of Foreign Tin had accumulated to 5,079 tons at London on April 1, against 1,977 in 1874, the movement from the Straits, as shown above, has also been twice as extensive to America as it was early last year. Any extraordinary check upon this supply, pointed out above, would help the metal materially, but if large receipts from Australia are coming forward simultaneously, we can foresee nothing but still lower figures. The prolonged monotony on this coast was broken these last few days by the sale to dealers of 7000 slabs, Straits, at Boston, at 19¼c. @ 19½c., gold, held for a couple of years past, and sold for the closing up of an estate. Although inactive, the market is firm at the following gold quotations: Straits, 20c. @ 20¼c.; English Common, 19¾c. @ 20c.; ditto Refined, 20c. @ 20¼c., and Banca 24c. @ 24½c. Tin Plates have been decidedly dull, the dealings being confined to a jobbing trade. We quote ordinary brands as follows: Charcoal Bright, $9·12½ @ $9·62½; ditto Ternes, $8·25 @ $8·62½; Coke Tin, $7·50 @ $7·62½, and ditto Ternes $7·00, all gold, per box.

Lead.—Greater firmness, with an improvement of 5/ is reported from London, owing, in all likelihood, to increased activity in the demand for consumption. It is fair to presume that consumers have been resolutely holding back ever since January 1, and as they were known to be light stocked even previous to that period, a sound revival can now easily bring about an even more important rise. According to the latest Paris papers it should be remarked, however, the Linares region, in Spain, which turns out 65,000 tons annually, was getting on remarkably well. While, therefore, the European markets may be temporarily looking up, such improvement is likely to be short-lived. As for our own market, a rather better feeling seems to have been obtained also, without leading to any advance yet. Of Selby, since our last, 90 tons sold on the dock at $5·82½, gold, since when but a straggling business has been done. We quote Domestic $5·80 @ $5·85, gold, at which it is steady. Western telegraphic offers are made at 6·80c. @ 6·85c., currency, delivered here immediate shipment, in lots of 50 tons. Foreign is quiet and nominal at 6⅝c. @ 6¾c., gold. The manufactures of Lead are steady, Bar at 8½c.; Pipe, 9c.; and Sheet, 9⅛c., less 10 per cent. to the trade.

Spelter and Zinc.—Spelter is devoid of interest at nominally 7c. @ 7¼c., gold, for Silesian, and 7c., currency, Common Domestic. European accounts to hand are, on the whole, firm, without much doing. Business here still lacks vitality; the expectations that had been formed early in the spring have as yet remained unfulfilled. We hardly remember a time when Spelter has been as dull as it is at present. *Sheet Zinc* is quiet and unaltered at 9c. @ 9¼c., gold.

Antimony.—Very little transpires in it beyond a small jobbing trade. We quote from 12¼c. @ 12¾c., gold. London is £55. 10/.

COAL.

The Coal market is without any definite change since our last report. The production this year will fall short 1,500,000 tons of last year, and should the strike continue another month 500,000 tons more may be deducted from supplies. With this large deficiency on the year, stocks are very nearly exhausted. Dealers have great expectations of doing a large business as soon as trade opens.

The quantity sent from the Schuylkill region for the last week was 11,889 tons, against 106,631 tons for the corresponding week last year. Decrease, 94,742 tons.

The supply sent from all the regions so far this year is 3,295,567 tons, against 4,124,837 tons to same period last year. Decrease, 829,270 tons. The decrease in the supply of Anthracite is 954,718 tons.

A meeting of the Executive Board of the Miners' and Laborers' Benevolent Association has been called at Pottsville, April 22 (to-day), when the question will be discussed and voted upon whether to continue the strike or not. A circular has been issued calling on every member to be present. The dissatisfaction existing among some miners arise from a secret circular issued to each branch, which says, the time has arrived when a change of programme is necessary; that there is great scarcity of Coal, notwithstanding the suspension has not been general; that there is a heavy demand for Coal, and many individual operators of collieries are in such condition that if work does not proceed immediately they will be unable to ship Coal during the year, and the miners are becoming poor. The following propositions are to be voted on: (1). That the demand for the $2·75 and $3 basis be withdrawn, on the ground that we are willing to make that much concession to the professed necessities of our operators, and that the demand is not general through all the regions. (2.) That members of the union shall return to work for whoever will pay the basis, regardless whether it be signed for the year or not; but that no coal be shipped from the collieries of the Philadelphia and Reading Coal and Iron Company until such time as a settlement has been made by the committee of the Coal Exchange and the Miners' and Laborers' Benevolent Association. This resolution will allow dead work to be done for the Coal and Iron Company.

The general impression is that this circular shows signs of weakness among the entire organization, and the leaders are charged with attempting to destroy private mines and cripple business for the remainder of the year. Many miners are leaving the region to seek employment elsewhere. Ten thousand persons are employed in the coal trade in this region, and the result of the meeting to-day is anxiously looked for by all classes. It is impossible to predict the result at this time, though it is generally conceded if left to a direct vote of the miners there would be a resumption of work at every colliery immediately.

We quote as follows: Anthracite, $4·35 @ $6·25; Cumberland, $6·50 @ $6·75; West Virginia, $6·75 @ $7; James River Steam, $6·25; James River Carbonite, $9; Kanawha House, $14·25; American Gas, $7 @ $7·25; American Cannel, $12 @ $14; Pennsylvania and Westmoreland, $7·25; Murphy Run, $7·40; Newburg Orrel, $7·50; Sterling Ohio, $12; Ince Hall, $17 @ $18; Liverpool House Cannel, $17 @ $18; Liverpool Gas, $11; Newcastle Gas, $7 @ $7·50; Scotch, $9

The Coal transported over the Cumberland Branch Railroad during the week ending April 17, 1875, amounted to 4281 tons, as against 6120 tons shipped in the corresponding period of last year, showing a decrease of 1839 tons. Over the Cumberland and Pennsylvania Railroad, for the same period, the shipments were 40,696 tons, against 48,810 tons shipped in 1874, a decrease of 8114 tons. The aggregate amount of Cumberland Coal shipped by the various companies so far this year amounts to 386,134 tons.

IMPORTATIONS.

Of Hardware, Iron, Steel and Metals into the Port of New York, for the week ending April 20, 1875:

Hardware.

Buchenholz B.
Cases, 1
Boker Hermann & Co.
Mdse. pkgs., 4
Packages, 16
Curley J. & Bro.
Cutlery, cks., 1
Fuller Bros.
Mdse. pkgs., 2
Field A. & Co.
Mdse. pkgs., 19
Friedmann & Lauterjung
Cutlery, cs., 3
Godwin R. J. & Son,
Wire, cks., 1
Hildick A. H.
Chains, 3
Chains, cks., 5
Howard, Sanger & Co.
Per. caps, cs., 4
Lord D. Jr.
Rifles, cs., 1
Moore's J. P. Sons,
Mdse. pkgs., 9
Merchants' Dispatch Co.
Arms, cs., 4
Mott J. L. & Co.
Mdse. pkgs., 1
Patterson Bros.
Mdse. pkgs., 3
Remington E. & Sons,
Guns, cs., 2
Schoverling & Daly,
Mdse. pkgs., 4
Cases, 2
Varney & Doe.
Per. caps, cs., 5
Van Wart & McCoy,
Mdse. pkgs., 5
Wiebusch & Hilger Mfg. Co.
Mdse. pkgs., 8
Ward A.
Mdse. pkgs., 2
Order.
Fire grates, cs., 10

Iron.

Henderson Bros.
Pig, tons, 100
Irwin R. & Co.
Pig tons, 200
Laughland & Co.
Hay bands, cks., 12; bales, 1; bdls., 550
Lang W. Bailey & Co.
Mdse. pkgs., 48
Lennox E. S.
Rods, bdls., 36
Naylor & Co.
Mdse. pkgs., 200
Spiegel, tons, 25
Order.
Pig, tons, 209
Pig, pkgs., 35

Steel.

Brown Wm.
Cases, 16
Bundles, 8
Prosser Thos. & Son,
Mdse. pkgs., 94
Sanderson Geo. & Co.
Cases, 10
Bundles, 140
Woodford W. O.
Cases, 44
Order
Bundles, 420

Metals.

Byrne Joseph & Co.
Tin plates, bxs., 1226
Tin, slabs, 250
Dickerson J. S. & Co.
Tin plates, bxs., 2675
Haxtun B.
Lead, pigs, 1993
Naylor & Co.
Tin plates, bxs., 1110
Phelps, Dodge & Co.
Mdse. pkgs., 2961
Order.
Tin plates, bxs., 4240

OLD METALS, PAPER STOCK, &c.

Business in this market has been very active the past week, and dealers have obtained, as a rule, full prices for their accumulations. Our quotations remain the same as last reported, with the exception of Book Stock No. 2, which has advanced ¼c. a pound. The market for Rags, Paper Stock and Rope is still improving, and prices are firm. Old Metals still continue dull, and quotations are nominally unchanged. We quote the following as the current purchasing rates:

Old Metals.—Copper, 16c. @ 17c. per lb.; Yellow Metal, 11c.; Brass, 10c. @ 12c.; Composition, heavy, 13c. @ 14c.; Lead, solid, 5¼c.; Tea Lead, 4¼c.; Zinc, 4¼c. @ 4½c.; Pewter, No. 1, 18c.; do., No. 2, 8c. @ 12c.; Spelter, 5c. @ 5½c., Wrought Iron, 1¼c.; Sheet do., ½c.; Cast, do., ½c.; Machinery, do., ¾c.

Rags, &c.—Canvas, Linen, 5c. @ 5½c.; do. Cotton, No 1, 6c. @ 6½c.; No. 2, 2½c.; White, No. 1, 6½c.; No. 2, 4½c.; Colored, do., 2c. @ 2½c.; Mixed, Woolen, 2c. @ 3c.; Soft, do., 5c. @ 5½c.; Gunny Bagging, 1¾c.; Jute Butts, 1¾c. @ 2c.; Kentucky Bagging, 3c.; Book Stock, 3c.; Waste Paper and Scraps, 1½c.; Kentucky Bale Rope, 4c.; Oakum Junk, No. 1, 4½ @ 5c.; do. No. 2, 3c.; Tarred Shaking, 1c. @ 1½c.; Grass Rope, 2½c. @ 3c.

PHILADELPHIA.

PHILADELPHIA, April 20, 1875.

The iron market is quiet, but prices are steady with some expectation of an advance in pig iron if any increased demand should appear shortly. These expectations are based on the fact of the termination of the Pittsburgh lockout, by the yielding of the mill owners and the exceedingly small production at present, owing to the few furnaces in blast in Eastern Pennsylvania from lack of coal. Locally, the demand for pig iron is very light. Navigation has opened, but there seems to be no improvement in demand. Rumors of an early termination of the coal strike are in circulation, but cannot be verified by any reliable authority. The situation is certainly very disastrous for all branches of the iron trade, and one which admits of no explanation, since even with the restricted production there seem to be few purchasers for what little iron is being made. In Manufactured Irons there has been a somewhat better feeling, and Bars were in moderately fair request, with a fair prospect of a further advance. This will probably be now checked by the resumption of work at Pittsburgh, and

competitions will once more begin between Eastern and Western irons. In Rails there are numerous inquiries, but the terms offered by the railroad companies are generally such as are unacceptable to the mill owners. There have been some transactions, or rather negotiations, for a considerable lot of Steel Rails for South American account. This is a market which deserves the close and earnest attention of all branches of the iron trade, and if developed as it should be would speedily relieve the present dullness. Old Rails and Scrap are not so active, and the general tone of the market is quiet, with, however, no apparent disposition to weaken prices. We quote the following as the ruling rates at present in this city, viz.:

PIG IRON.—No. 1 Foundry, $27 to $28; No. 2, $25 to $26; Gray Forge, $24 to $26.
BARS.—2·8c. per lb.
RAILS.—$48 to $53 at works.
OLD RAILS.—$29 to $31, as to delivery.
SCRAP.—$34 to $35 for No. 1 Wrought.

The sales include in addition to the usual small lots of Foundries, 800 tons No. 1 at $27, and 1000 tons Forge and Pipe Irons at low rates; 2000 tons Old Rails at $29 here; 3000 tons New Rails at a private price, and 500 tons Scrap at $35.

PITTSBURGH.

The Pittsburgh *Commercial* of April 17th says: The inquiry for Pig Metal during the past few days has been fair, and the resumption of the rolling mills has infused a tolerable degree of life and firmness into the market. The demand for metal has not been up to what the most sanguine expected, as the mills are generally pretty well supplied with metal purchased some weeks, or even months, ago, but not yet delivered. This stock of Iron will probably be sufficient for the ordinary consumption of the rolling mills during the next thirty days, and if the market for Manufactured Iron proves favorable, an increased inquiry may then be looked for. The existing Coal strikes and supposed short supplies of metal also create a firm feeling among holders, some of whom predict an important advance in prices. But it must be borne in mind that the circumstances of the Bar Iron manufacturers will not allow them to pay any very marked increase over present rates, and that an attempt on the part of the holders to put Pig metal up $5 per ton would be likely to cut off nearly, if not quite, all the demand. Most of the transactions thus far have been at current rates, and yesterday there was a moderate inquiry at these figures. Makers of leading brands of Gray Forge Irons, however, instructed their brokers yesterday morning to hold at $35, which is now the general asking price. No sales were made at the advance except one lot of Extra Gray Forge, which brought that figure. The trade in Muck Bar, Blooms and Scrap Iron has been rendered less active by the cessation of the lock-out, and in consequence prices are easier. Receipts of Scrap Iron continue liberal, but nearly all that is coming in was contracted for some time ago. We report the following sales:

BITUMINOUS COAL SMELTED FROM I. S. ORE.

100 tons extra gray forge	$35·00—4 mos.
600 tons gray forge	24·00—4 mos.
200 tons gray forge	24·00—4 mos.
200 tons gray forge	24·00—4 mos.
200 tons gray forge	24·00—4 mos.
100 tons gray forge	23·25—cash.
100 tons close gray forge	23·00—cash.
200 tons white and mottled	21·50—cash.
100 tons mottled	20·25—cash.

ANTHRACITE.

30 tons No. 2 extra	$25·50—4 mos.
30 tons carbonized	24·00—4 mos.

HANGING ROCK CHARCOAL.

85 tons Nos. 2 to 1	$28·00 @ 33·00—4 mos.

CINCINNATI.

Messrs. L. R. HULL & Co., under date of April 19th, write us as follows: PIG IRON.—The market is still rather quiet, with no apparent tendency to change prices, which will doubtless be well maintained throughout the season, with a strong probability of an advance at any time. The stocks of Foundry grades are not large, and the supply of Mill Iron is still decreasing. Cold Blast unchanged. We to-day quote as follows:

HOT BLAST CHARCOAL.

Hanging Rock No. 1...₱ ton.	$29·00 @ 30·00—4 mos.
" " No. 2	27·00 @ 28·00—4 mos.
" " Forge	25·00 @ 26·00—4 mos.
Tennessee No. 1	27·00 @ 28·00—4 mos.
" Forge	25·00 @ 26·00—4 mos.
Alabama No. 1	27·00 @ 28·00—4 mos.
Missouri No. 1	29·00 @ 30·00—4 mos.
" No. 2	27·00 @ 28·00—4 mos.

HOT BLAST STONE COAL.

Missouri No. 1 ₱ ton.	$28·00 @ 29·00—4 mos.
" Forge	26·00 @ 27·00—4 mos.
Mahoning No. 1	28·00 @ 29·00—4 mos.
" Forge	26·00 @ 27·00—4 mos.
Am. Scotch, No. 1	26·00 @ 28·00—4 mos.

COLD BLAST CHARCOAL.

Hanging Rock Car Wheel ₱ tn.	$35·00 @ 50·00—4 mos.
Missouri " "	43·00 @ 45·00—4 mos.
Kentucky " "	40·00 @ 42·00—4 mos.
Tennessee " "	36·00 @ 42·00—4 mos.
Georgia " "	40·00 @ 42·00—4 mos.
Alabama " "	40·00 @ 42·00—4 mos.
Machinery and Forge	40·00 @ 42·00—4 mos
Blooms	70·00 @ 90·00—4 mos.

ST. LOUIS.

Messrs. SPOONER & COLLINS, Iron commission agents, 409 North Third street, St. Louis, under date of April 16, report the Iron market as follows: Our market has been quiet the past week. Inquiry for Mill Irons is still good. We quote as follows on four months:

Mo. Stone Coal, No. 1 F'dry.	$29·00 @ 31·00—4 mos.
" " No. 2 F'dry.	27·00 @ 29·00—4 mos.
" " No. 1 Mill...	26·00 @ 28·00—4 mos.
" Charcoal, No. 1 F'dry...	29·00 @ 31·00—4 mos.
" " No. 2 F'dry...	27·00 @ 29·00—4 mos.
" " No. 1 Mill ..	26·00 @ 28·00—4 mos.
Tenn. Charcoal No. 1 F'dry..	29·00 @ 31·00—4 mos.
" " No. 2 F'dry..	27·00 @ 29·00—4 mos.
Ill. R. " No. 2 F'dry..	30·00 @ 32·00—4 mos.
Massillon, No. 1 Foundry....	36·00 @ 37·00—4 mos.
" B, No. 1 Foundry..	34·00 @ 36·00—4 mos.
" No. 2 Foundry....	33·00 @ 34·00—4 mos.
Cold Blast Car Wheel, Mo....	40·00 @ 42·00—4 mos.
" " Tenn.	37·00 @ 45·00—4 mos.
" " Hanging Rock	53·00 @ 56·00—4 mos.
Mo. Charcoal Blooms	75·00 @ 85·00—4 mos.
No. 1 Wrought Scrap	1¼c. per lb.
Machinery Cast "	1c. "
Stove Plates	¾c. "

BOSTON.

BOSTON, April 17.—*Pig* is, by all odds, duller than ever the past week. The drop of 10c. a hundred on light Iron in the junk market, and the placing of the city's contract for 1000 lamp posts with the Whiting Foundry at 2½c., seem to have impressed the market that "something is just about to happen." The lamp post bid calls for good, well finished castings, each post to weigh 850 pounds. Offers were in from all quarters of the Union, and ranged from 2 5-16 to 3c per pound. One or two parties have been courageous enough to offer good prime No. 1 X at $23, without being taken up, while brokers still quote to reporters $32 to $33. The primary markets, notwithstanding the coal riots, do not tone up, but continue to offer lots here $27 to $29 No. 1; $24 to $27 No. 2; and $22 to $26 Gray Forge. *Bar* is steady, quoting and selling at $90. The stock has again begun to work down a trifle, but yet secures no buoyant features. There is rather less irregularity than noted a week ago, but still there are a few spots where the right buyers do find a slight let down. *Steel* is moving along in a quiet way; rather less doing than previously reported, owing, probably, to the storm and bad going of the week. We quote American Tool, 15c. to 15½c.; American Machinery, 9½c. to 10c.; do. Tires at 6½c. to 7c.; English Tool, 16c. to 17c. *Copper* was advanced 1c. on Saturday last, the result of a combination with the mining companies. The demand from the manufacturing companies had just begun to be felt, but this turn has rather checked the consumption of new, and turned attention more fully to old metals. We quote spots and futures firm at 22¼c. to 22½c. We quote New Sheathing 28c.; Bolts and Braziers, 30c.; Yellow Metal Bolts, 28c. *Lead* is having a fair business, with prices generally quite steady. We quote Domestic 5¾c.; Sheet and Pipe, 9c., currency; Tin Lined Pipe, 16¼c.; Bar Lead, 9c., less usual trade at 10 per cent. discount. *Spelter* is in better request at $7·30, gold, for Silesian, and 6½c., currency, for Domestic. *Tin* is lower, the result of the coming along of heavy lots both of Straits and English. We quote Straits 20c.; Banca, 24½c.; Refined English, 19¾c., gold. Plates are active. We quote Charcoal I. C., $10 to $12·50; Coke, $8 to $10; and Terne at $8 to $12·50 per box, currency.—*Com. Bulletin.*

LOUISVILLE.

Messrs. GEO. H. HULL & Co., under date of April 10, writes us as follows: The market is quiet and sales comparatively light. The usual time, 4 mos., is allowed on the quotations below:

HOT BLAST CHARCOAL.

No. 1 F'dry, from Hanging Rock Ores.	$28·00 @ 29·00
" 2 " " " "	26·00 @ 27·00
" 1 Mill, " " "	25·00 @
" 1 F'dry, from Alabama, Georgia and Tennessee Ores	26·00 @ 27·00
" 2 F'dry, from Alabama, Georgia and Tennessee Ores	25·00 @ 26·00
" 1 Mill, from Alabama, Georgia and Tennessee Ores	25·00 @

HOT BLAST STONE COAL AND COKE.

No. 1 F'dry, from Hanging Rock Ores.	$27·00 @ 28·00
" 2 " " " "	25·00 @ 26·00
" 1 Mill, " " "	24·00 @ 25·00
" 1 F'dry, from Alabama, Georgia and Tennessee Ores	26·00 @ 27·00
" 2 F'dry, from Alabama, Georgia and Tennessee Ores	25·00 @ 26·00
" 1 Mill, from Alabama, Georgia and Tennessee Ores	24·00 @ 25·00
No. 1 F dry, from Missouri Ores	28·00 @ 29·00
" 2 " " "	27·00 @ 28·00
" 1 Mill, " "	27·00 @ 28·00

COLD BLAST CHARCOAL.

Car Wheel from Hanging Rock Ores..	40·00 @ 50·00
" " Tennessee Ores	35·00 @ 37·00
" " Alabama Ores	38·00 @ 40·00
" " Kentucky	30·00 @ 42·00

RICHMOND.

ASA SNYDER, Iron Merchant and Furnace Agent, Richmond, Va., writes as follows under date of April 19: Quotations unaltered. There is some weakness in the market, owing to a few forced lots being offered at reduced figures. Otherwise holders are firm.

No. 1 and 2, Car Wheel Irons	$30·00 @ 35·00
No. 3 and 4, " "	29·00 @ 33·00
No. 5 and 6, " "	28·00 @ 32·00
Virginia Anthracite, No. 1 ex	29·00 @ 30·00
" " No. 2 ex	27·00 @ 28·00
" Coke, No. 1 ex	27·00 @ 28·00
" " No. 2 ex	26·00 @ 27·00

BALTIMORE.

Messrs. WYETH & BROTHER, Iron and Steel merchants, South Charles and Lombard streets, report us the following prices under date of April 20: There has been but little improvement in this market for the past week, notwithstanding dealers' efforts to meet buyers' views. Demand from every quarter rules exceptionally light for the season, and we quote the market quiet with list unchanged:

AMERICAN REFINED BAR IRON.

1 to 6 wide by ⅜ to 1 thick.. } 1 to 4½ wide by 1½ to 2 thick }	2·6-10 to 2 7-10c. ₱ lb.
Round and square, ordinary sizes, from ⅜ to 2 inclusive	2 6-10 to 2 7-10c. "
Hoop Iron, 1½ wide and upward	4½ to 4¾c. "
Band Iron, from 1¾ to 4 in. wide	3¾ to 3¾c. "
Horse Shoe Iron ⅜ to 1 wide by ⅜ to ½ thick	4 to 4¼c. "
Norway Nail Rods	6¾ to 7c. "
Black Diamond Cast Steel, Flats, Squares and Octagon, ordinary sizes	15½ to 16c. "
Machinery Steel	11 to 11½c. "
Cast Spring Steel	10 to 10½c. "
Homogeneous Steel Plate	10½c. "
Perkins' Horse Shoes, per keg of 100 lbs.	$5 62½
" Mule Shoes " "	6·62½

Common Horse Nails, from 14c. to 18c. per pound.

10	9	8	7	6	
Putnam Horse Nails..23	24	25	26	28c.	per ₱.
10	9	8	7	6	
Globe Horse Nails...23	24	25	26	28c.	per ₱.

R. R. Spikes.....5¾ by 9-16 at 3c to 3¼c. per lb.

Messrs. R. C. HOFFMAN & Co., Iron and commission merchants, Nos. 23 and 25 South Frederick street, report the Pig Iron market as follows, under date of April 20: The market still continues depressed and unsettled, with a limited demand for immediate consumption. Market dull. We quote:

Baltimore Charcoal	$32·00 @ 36·00
Virginia "	31·00 @ 35·00
Anthracite No. 1	27·00 @ 28·00
" No. 2	26·00 @ 27·00
" No. 3	24·00 @ 25·00
White and Mottled	20·00 @ 23·00

CLEVELAND.

Messrs. C. E. BINGHAM & Co., 25 West Main street, under date of April 19, quote the Iron market as follows, 4 mos. time:

LAKE SUPERIOR CHARCOAL.

No. 1	33·00—4 m.
No. 2	32·00—4 m.
No. 3	33·00—4 m
No. 4	34·00—4 m.
Nos. 5 and 6	35·00—4 m.

BITUMINOUS FOUNDRY.

No. 1 Foundry	$30·00—4 m.
No. 2 Foundry	28·00—4 m.
No. 1 Gray Forge	26·50—4 m.

AMERICAN SCOTCH.

No. 1, Cherry Valley	$32·00—4 m.
No. 2, "	28·00—4 m.

MASSILLON.

Massillon No. 1	$31·00—4 m.
B—1	29·00—4 m.
Massillon No. 2	27·00—4 m

FOREIGN.

FRANCE.

(Moniteur des Interets Materiels.)

PARIS, April 4, 1875.—*Metals.*—The European metal markets have been quiescent during the week under review; prices have been upheld with difficulty, and in some localities have declined, due in a measure no doubt to recent failures in England, leading to forced realizations of stocks not only there but also on the Continent. Although the money market has as yet given no signs of a tightening tendency, great caution seems to be the rule, and no encouragement is held out to speculators for a rise in metals. *Copper.*—There are no special features; the English market, though lacking in strength, still bears up against the adverse tendencies that have been at work recently tolerably well, particularly as regards Chili bars, still commanding £80, 10/ against £75 a year ago, when the visible supply was 4150 tons larger. The West Coast charters, up to the 16 ultimo, were 9300 tons against 10,500 in 1874; from a statistical point of view the position is consequently not a bad one, but the price is, as we have shown, higher and it altogether depends on the demand whether it can be sustained, since much of a speculative support cannot be expected in the immediate future. The French markets have ruled steady at the following quotations: Paris.—Chili Bars, deliverable at Havre, 212·50 francs; Common ditto, 208·50; Ingots, 220; English Tough Cake, 220; and pure Corocoro Ore, 212·50. Havre at 213 for Chili Bars. Marseilles, 225 for Refined Ingots. *Tin.*—The speculation which had been productive of an advance has been short lived, not having met with the assistance which had been counted upon, in the shape of a high ruling at the Dutch Trading Society's sale. While the stocks of Straits Tin are as large as they are at present, even the satisfactory nature of the deliveries has little chance to favor a speculative movement. We quote here and at Havre, on a quiet market, Banca, 245 francs; Straits, 235; and English, at either Havre or Rouen, 235. Marseilles is supported at 250 for Banca and 235 for Straits. *Lead.*—The calm attitude observable for some time past in this metal remains undisturbed. Some more detailed accounts have come to hand from the chief mining district in Spain—that of Linares—according to which matters are proceeding there in a satisfactory manner as regards the extraction of ore and smelting. The ore is of excellent quality, and prepared by machinery to a percentage of 78. Nearly all the produce is smelted on the spot. The proportion of Silver is 10 to 18 ounces per ton. The Coal used is mostly from the neighborhood. Seven thousand men are employed at between 50c. and $1 per day, and the English companies alone, representing more than one-half of the capital invested, spend £1000 a day. This Linares district yields 65,000 tons of Lead annually. One mine alone gives 7000 tons per annum, and several produce upward of 5000 tons. The companies pay large dividends, from 12½ per cent. upward. No political disturbances affecting these mines at present. Facts of this kind are of deep interest at this particular juncture. Our markets have, nevertheless, shown no particular weakness. We quote French, deliverable here, 54 francs; Spanish, deliverable at Havre, 54·50; English, at Havre, 53; and Belgian and German, at Paris, 54·50. Marseilles is quiet and nominal at 49 francs. *Spelter* has been generally inactive. We quote Silesian, at Havre, 61·50; other good brands, at Havre, 60·50; and at Paris, 61. Marseilles is firm and unaltered. *Iron.*—Less buoyancy is noticeable in the French markets. The import of Iron is on the increase, and the export on the decrease. We have imported three times the quantity of Steel we received during the first two months of 1874, which is rather a disquieting feature. The Haute Marne, which had been looking up, is again flat. Saint Dizier, on the other hand, continues to improve. The Ardennes are quiet at 115 for Common Charcoal Pig. *Coal.*—Despite the cool weather, Coal for domestic purposes has moved off slowly, and the lack of activity in industrial circles has prevented animation in that direction. Prices are sustained with difficulty.

BELGIUM.

(Revue Universelle).

BRUSSELS, April 4, 1875.—*Iron.*—There being a slight amelioration in the accounts from England, a better feeling has begun to obtain in Belgian Iron circles, although no very tangible improvement in the demand has as yet been reported. Affinage Pig may be quoted 75 to 80 francs; Iron Rails are held at 175 to 185, too high to enable us to compete with the English abroad. According to the official statement, there were imported into Belgium, during the month of February, 59,773 tons of Ore, 9419 tons Pig Iron, and 727 tons Wrought, while we exported 14,019 tons Ore, 977 tons Pig Iron, 7328 Rails, 1187 Sheet Iron and 6585 Wrought. The branch of industry which has been and is suffering most in our country is the building of locomotives, and the construction of railway material generally. Orders in that line have been restricted of late to the manufacture of cars for the Marseilles, Lille and Antwerp horse railroads, after the newly introduced pattern. *Coal* is in anything but a comfortable position; while our import has been largely on the increase since January 1, our export has been diminishing, the balance against us for the first two months of the year being 173,435 tons. Some of our larger Coal companies have resolved to reduce both production and prices, but we doubt their success in artificially stimulating a demand, as long as Belgian Iron industry suffers from general prostration in business. The fact is that both in England and Germany the Coal deposits are, for the most part, found in horizontal layers, and a miner can produce twice the quantity which can be raised by a single operative in Belgium; it will consequently be imperative to lower wages in order to enable us to successfully compete in our own market with Coal, the product of those countries which have begun to largely undersell us.

GERMANY.

(Borsenhalle.)

HAMBURG, April 3, 1875.—*Metals.*—The past month has been an unfavorable one. The continuance of the strikes in England, the large arrivals from the producing countries, the slow diminution of stocks at the centers of consumption, all these causes combined have not failed to create a feeling of uneasiness in the minds of purchasers, thus leading to a pretty much universal weakness in values, if we except the passing excitement in Tin. Transactions have thus been restricted to filling the more immediate requirements of consumers. *Copper* has been devoid of life in the German markets. We quote Drontheim, here, 94 marks; Demidoff, 100; Minnesota, 106, and Chili, 89. At Berlin the market as been steady at the following quotations: Good qualities English and Australian 91 to 94 the 50 kilos, and Refined Mansfield, 94 to 95; Stettin, Swedish, English and Chili, 105. *Tin.*—While the late speculation for a rise in England and Holland lasted, our markets remained comparatively uninfluenced, and consequently now show little alteration. Banca at Berlin is steady at 100 to 102 marks the 50 kilos, English at 97 to 99. We are tolerably firm here at 102 to 104 Banca, and 100 to 102 English Refined. *Lead* is quiet. We quote Tarnowitz, Hartz and Saxonian at Berlin, 23 to 23·50; English Pig there, 25 to 25·50; German, 23·75 to 24·50; and Spanish, 24·50 to 25. At Stettin Spanish sells at 26·25 to 27. Tarnowitz 24, and other German brands 24. *Spelter* is slightly higher to arrive, but unaltered on the spot. Berlin remains sustained at 25·50 to 26 the 50 kilos; Breslau, 24·75 for common brands, and 25·55 W. H. Stettin telegraphs 27. Here we have remained at 23·50 on the spot, and 23·50 to 24 to arrive.

HOLLAND.

(Koch & Vlierboom.)

ROTTERDAM, April 6, 1875.—*Metals.*—*Copper.*—There is a supply sufficient to meet requirements, but prices remain steady, Drontheim at 50 to 52 guilders. Russian Crown 51, and English 53. Stocks in Europe are estimated at 24,000 tons, while there are afloat 14,000. *Tin.*—At the company's sale held at Amsterdam on the 31st ultimo, 22,784 slabs Banca sold at 52¾ to 52¾ guilders, average 52 60, and 2953 Billiton at 51¾. The market is quiet since, spot Banca having gradually declinedto 51 ½; May sale delivery, at 52¾ at first, is now offering at 52. Billiton, April delivery, has been purchased as low as 49¾ guilders. The metal closes unsettled on account of the uncertainity which prevails with respect to the quantities likely to come forward from the Straits in the immediate future. *Lead.*—Greater activity now prevails. We quote Stolberg, 12¾ guilders; Spanish, 12¾; and German, various brands, 12¾. *Spelter*, although not active, shows considerable firmness. We quote Silesian 13 to 13¼ guilders. *Tin Plates* in slack demand at 18 to 20 guilders per box.

Our English Letter.

Review of the British Iron, Steel, Metal and Hardware Trades.

(From our Regular Correspondent.)

SHEFFIELD, ENG., April 3, 1875.

THE STATE OF TRADE

continues so uninterestingly quiet that it is difficult to allude to it in terms which shall be at one and the same time accurate and readable. Such, nevertheless, is the case throughout the whole country, and, so far as one can at present foresee, the prevalent inanition is not likely to be broken through for many weeks, or even months, to come. The decision of the leading Staffordshire iron masters—to which I alluded last week—has not had the best effect on the market there and in other districts, but I hardly think, personally, that the second-class and inferior producers will be content to abide by the dictum so put forth. I think it just possible, although highly improbable, that an alteration may be declared even yet, at the quarterly meetings later this week.

TRADE SECRETS

are, as everybody knows, nowhere more jealously guarded than at Sheffield. Many amusing anecdotes are related as to the attempts made by competitors and foreign manufacturers to gain possession of some long coveted and strictly guarded mode of making a particular article. A firm—let us say V. & Co.—received a note some time back from the head of a German house with which they do a good deal of business, stating that the son of one of the partners was coming to England to learn English, and asking whether they (V. & Co.) could find him any little employment in their offices which would aid him in acquiring the language. V. & Co. agreed to do so, and the young man was placed in the correspondence office. One day, however, he was found in the works, making drawings of portions of the special machinery. He was promptly ejected, and, I may say, is no longer seen about the premises of V. & Co.

ANOTHER "COMPETITION" SCARE.

A Wolverhampton correspondent, who probably derives his inspiration from an American source, writes that the Cornwall Iron Company, of Cedar Bluff, Cherokee county, Alabama, is shipping 100 tons of its charcoal pig iron to this country, the freight from Savannah to Liverpool being 10/ per ton. The same correspondent believes a previous lot realized about £7 per ton net in Liverpool, and that it only cost a dollar more per ton sending to Liverpool than it would to Cincinnati. As you probably know more about the matter than we do here, I offer no comment, and should not have alluded to the matter but for the fact that we sometimes have to "go from home to hear home news."

A HEAVY FAILURE.

Messrs. Henley & Company, the eminent telegraph engineers and makers of cables for telegraphic purposes, of North Woolwich and London, have suspended payment, with liabilities amounting to about £500,000. The failure is attributed to a lock-up of capital, the demand for cables having recently become greatly restricted.

THE SCOTCH PIG IRON TRADE.

There has, again, been much quietude in the general condition of the Glasgow warrant market since the resumption of business after the Easter holidays. Prices varied from 72/ down to 70/6, at which figures they now remain. The stock in Connel's stores has been slightly augmented during the week, and now amounts to about 29,160 tons, as against over 36,000 tons at this time last year. There are now 119 furnaces in blast, a considerably larger number than at the corresponding date of 1874, when the miners' strike prevailed. Freights have not altered since last week, Glasgow to New York being 7/6, and Ardrossan to the same port 10/ per ton. To "Bosting" the figures are, respectively, 12/6 and 13/.

Writing on the evening of April 2d, from Glasgow, Messrs. James Watson & Co. said: "We have to report a further reduction in the prices of Scotch pig iron, the warrant market having fluctuated between 72/ and 70/, cash, closing buyers at 70/3, sellers 70/6. Shipments last week were 10,325 tons, against 10,601 tons in the corresponding week of 1874."

	No. 1.	No. 3.
G. M. B., at Glasgow	72/	70/
Gartsherrie, "	80/6	75/6
Coltness, "	83/	73/6
Summerlee, "	81/	73/6
Langloan, "	80/6	73/6
Carnbroe, "	77/	72/6
Calder, at Port Dundas	80/6	73/
Glengarnock, at Ardrossan	79/	72/
Eglinton, "	71/6	70/
Dalmellington, "	71/6	70/
Shotts, at Leith	80/	73/6
Kinneil at Boness	75/6	70/6

Messrs. Colvin & Co. (Glasgow, 6th April, 1875), says: "We have to report a very flat market since the date of our last circular, the business done being limited. On Wednesday last the price was 71/6, since then it has steadily declined, and the closing quotations this afternoon are 69/ buyers, sellers 69/3. We subjoin the prices of makers' iron.

	Deliverable alongside. No. 1.	No. 3.
G. M. B., at Glasgow	71/6 @ 72/6	70/ @71/
Gartsherrie "	80/	75/6
Coltness, "	82/	73/
Summerlee, "	80/	73/
Langloan, "	80/	73/
Carnbroe, "	76/	71/
Monkland "	72/	71/
Clyde "	73/6	71/
Govan, at Broomielaw	72/6	71/
Calder, at Port Dundas	80/	73/
Glengarnock, at Ardrossan	78/	71/
Eglinton, "	71/	69/
Dalmellington, "	70/	69/6
Carron, at Grangemouth, selected	80/	77/
Shotts, at Leith	80/	73/
Kinneil, at Boness	75/	69/
Bar Iron	£9. 10/	
Nail Rods	£9. 10/	

SHIPMENTS.

	Tons.
Week ending 3d April, 1875	11,180
" 4th April, 1875	10,338
Increase	942
Total increase for 1875	11,168

Messrs. John E. Swan & Bros.' (limited) prices current, of same place and date, gives the following information:

Glasgow Brands.	Furnaces B'w'ng, 119	Furnaces Out 38.	Furnaces Built, 157.	Prices. No. 1.	No. 3.	No. 4
Gartsherrie	14	2	16	80/	75/	..
Coltness	12	0	12	82/6	73/	..
Summerlee	6	2	8	80/	72/6	..
Langloan	7	1	8	80/	73/	74/
Govan	1	4	5	72/6	71/	73/
Calder	6	2	8	*80/	72/	73/
Shotts Bess'mer	5	2	7	90/	85/	..
Shotts Ordinary				82/6	73/	..
Carnbroe	4	2	6	77/	72/	75/
Wishaw	2	1	3	..	..	..
Monkland	7	2	9	72/6	71/	70/
Chapelhall				..	..	..
Clyde	6	0	6	73/6	71/	72/
Quarter-Clyde	4	1	5	73/	71/	71/

* f. o. b. Glasgow, 1/ per ton, extra.

Glasgow Warrants, 3-5 No. 1; 2-5 No. 3, g. m. b., 70/3.

WEST COAST BRANDS—*f. o. b. Ardrossan.*

Glengarnock	7	2	9	78/6	71/6	74/
Ardeer	4	1	5			
Eglinton Brand'n	6	2	8			
Lugar Brand'n	4	0	4	71/	69/	70/
Muirkirk Brand'n	3	0	3			
Portland Brand'n	3	3	6			
Dalmellington	6	2	8	70/	69/	70/

EAST COAST BRANDS—*f. o. b. in the Forth.*

Kinneil	3	1	4	75/	71/	70/
Almond	2	1	3	73/6	71/	..
Carron Select'd	5	1	6	80/	..	..
Carron Ordn'y				75/	..	..
Lochgelly	2	2	4	71/	69/	..
Lumphinnans	0	2	2	..	70/	..
Bridgeness	0	2	2	..	..	..

Furnaces in blast in Scotland March 25.. 1875—119; 1874—86

TALLEST CHIMNEY IN THE WORLD.

The "Townsend" chimney, at Port Dundas, Scotland, is said to be the tallest chimney stack in the world, having been built by Mr. Robert Corbett, Duke street Glasgow, for Mr. Joseph Townsend of the Crawford street chemical works. The details of this work are these:

The total hight from foundation to top of coping is 468 feet, and from ground line to summit 454 feet; the outside diameter at foundation being 50 feet, at ground surface 32 feet, and at top of coping 12 feet 8 inches. The number of bricks used in the erection were as follows: Common bricks in chimney, 1,142,532; composition and fire bricks for inside cone, 157,468; common bricks for flues &c., 100,000; total, 1 400,000. The weight of bricks at 5 tons per 1000 is equal to 7000 tons. When within 5 feet of completion the chimney was struck by a gale from the northeast, which caused it to sway 7 feet 9 inches off the perpendicular, and it stood several feet less in hight than before it swayed. To bring back the shaft to its true vertical position, "sawing back" had to be resorted to, which was performed by Mr. Townsend's own men, ten working in relays, four at a time sawing, and two pouring water on the saws. The work was done from the inside on the original scaffolding, which had not been removed. Holes were first punched through the sides to admit the saws, which were wrought alternately in each direction at the same joint on the side opposite the inclination, so that the chimney was brought back in a slightly oscillating manner. This was done at twelve different hights, and the men discovered when they were gaining by the saws getting tightened by the superincumbent weight.

TRADES OF SHEFFIELD.

There is still a great dearth of trade news in this district, almost every branch of industry being in the lethargic condition which has prevailed for many months past. A good deal of disappointment is felt amongst merchant buyers and others to whom the cost of finished iron is of moment, at the decision to which several of the leading Staffordshire iron masters are reported to have come, not to make any alterations in their prices at the forthcoming quarterly meetings. This decision has, of course, considerable weight with the finished iron producers hereabouts; but it is presumed that many of the local makers will, at any rate, lower their figures in every possible instance where there is a chance of securing a good order by so doing. Already there is a wide discrepancy in quotations, one or two houses being willing to accept 10/ to 12/6 per ton less than their competitors for the same description of iron.

There is not much alteration in the values of hematite pig irons, but it is clear that large lots can be bought at somewhat less than the following nominal quotations: Maryport hematite, No. 3, 90/; No. 4, 89/; No. 5, M and W, 87/ per ton; Bessemer, No. 1, 92/6; No. 2, 90/; and No. 3, 87/6 per ton at the works; Millom Bessemer, No. 1, 90/; No. 2, 87/6; and No. 3, 85/; ordinary, No. 3, 85/; No. 4, 84/; No. 5, 90/; mottled, 95/; and white, 90/, all per ton at the works on four months' terms, or with the usual allowance for prompt cash.

There is a little better feeling in the cast steel industry, but it is not of a very marked character, and does not, at present, point to an early renewal of activity. Best tool and sheet steels, as well as steel wire, are, however, selling with greater freedom than they have lately been. Foreign irons are steady, but prices are not very firm, owing to the want of activity in the file and steel trades.

Large sized saws meet with a fairly good inquiry for the colonies and the principal timber growing countries of Europe and America, but smaller sizes do not sell at all readily, the home and other markets being believed to be overstocked in that respect.

The report of the directors of the Cardigan Iron, Steel and Wire Company, Limited, to be presented at the forthcoming annual meeting, states that there is a deficiency on the year's operations, chiefly owing to the heavy depreciation in the value of the stock and the losses on manufacturing made before the present board took office.

A special general meeting of the members of the Sheffield Chamber of Commerce and Manufactures was held on Friday last for the purpose of discussing several matters of considerable importance. One of the subjects dealt with was the new German trade marks law, the details of which were recited by Mr. Smith, the chairman. It was stated that all applications for registration of trade marks must be made to the Commercial Court at Leipsic, and that its jurisdiction must be submitted to. Mr. Ward (Ward & Payne) thought the matter of much importance, as the Sheffield manufacturers were suffering a great deal from the piracy of trade marks abroad. Mr. W. H. Brittain said that when he was in Germany, a short time ago, he saw thousands of pounds' worth of goods bearing his own corporate mark, as well as files, edge tools, and other goods bearing the marks of other Sheffield houses. Mr. Sorby produced some files and fictitious labels of his own marks, by which means the counterfeiter had secured a Russian order worth £1700. Another manufacturer mentioned that the German makers even came to Sheffield to buy paper, so that they might the better deceive buyers by its use. Mr. Brittain stated that, after the passing of the act of 1865, a German manufacturer positively offered to sell him, at a reduced price, a quantity of labels, which were warranted to be so close an imitation of his own label that no one could detect the difference. A resolution was passed, stating that the meeting regarded with satisfaction the new German law. The question of establishing courts of conciliation and arbitration was next considered, and a report was read, giving the detailed opinions of a committee which had been appointed to investigate the question. This report, which stated that the matter was difficult to dispose of, owing to the great variety of the trades of the town, and that it would be of no use unless the parties could be bound by whatever decision was arrived at, was adopted. The Lord Chancellor's patent bill was thought to be a great improvement in various respects upon its predecessors, but no resolution was passed on the subject. After an allusion to the question of the inconveniences caused by inaccuracies in foreign telegrams, the secretary reported that he had received a number of regulations in reference to the Philadelphia Exhibition in 1876, and would distribute them to the members of the chamber. The meeting then broke up.

The cutlery factors are not much better off for commissions than they have recently been, although it may be stated that some of the leading merchants and others are making up good consignments every week for the States and certain of the Eastern markets. Best table cutlery has a decidedly upward tendency, owing to the rise in the price and comparative scarcity of ivory. Your manufacturers are keen competitors with our own for the best classes

of African tusks, so that prices are hardly likely to recede, setting aside the French and German requirements. Best ivory is now, I am informed, about £960 to £980 per ton. Messrs. Rodgers & Sons, of Sheffield, are probably the largest holders of this precious material in the world. Other hafting materials are also dearer, partly in consequence of the fact that the German cutlers are being largely supplied by Sheffield "scale cutters."

ACCIDENT TO MR. MARK FIRTH.

Mr. Mark Firth, head of the famous Sheffield steel firm, and Mayor of Sheffield, had a mishap on Friday afternoon as he was riding on horseback along one of the principal streets. His horse slipped and threw him off sideways, causing an arm and one knee to be rather badly bruised and cut. Mr. Firth was promptly assisted and was sent to Page Hall, where he is at present residing, in a cab. It is hoped that he will not be laid by for any lengthened period.

THE COST OF ROLLING STOCK.

The following prices were paid recently by the Caledonian Railway Company for new rolling stock: An average of £3190 each for two new passenger engines and tenders; for three first, twenty-three third, one saloon and one post office carriage, £141,965, or an average of £1534 each for the twenty-eight vehicles; for sixty-eight mineral wagons, two cattle trucks and fourteen brake vans, £7907, or about £94 per vehicle. It is pretty clear that carriage and wagon building is not one of the most unprofitable of vocations.

TRADES OF STAFFORDSHIRE AND BIRMINGHAM.

Last week having been Easter week very little work was done at any of the iron and hardware establishments of the Black Country. At the usual weekly iron trade gatherings, held at Wolverhampton and Birmingham, few sales were made, buyers having so little need of iron that they could well afford to let the quarterly meetings pass over before placing their favors. For such specifications as have come into the market there has been an exceedingly keen competition, which has, naturally enough, sent down quotations below the artificial limits of "lists" and the open market. Nominally, all prices are unchanged. Really, they are substantially lower. The mean average selling price of finished iron during the past quarter in Staffordshire and the North of England having been found to be £9. 15/6, wages will have to be reduced by 2½ per cent. on and after July 3, next. The hardware industries show no change.

SOUTH WALES

still furnishes no news, yet that "no news" can by no means be accepted as being good news. The works are almost at a standstill, and the strike still continues on as large a scale as heretofore. Negotiations are in process between the Poor Law Inspector, the guardians and the masters, which may lead to the locked-out men being employed in iron making at a very low rate of wages, but nothing definite has as yet been arrived at. The bulk of the men are resolved to continue the fight, now that they have got through the winter and into the fine weather.

THE METAL MARKETS

have been quiet as a whole, copper being, however, a little steadier.

Messrs. French & Smith report: "This trade is still very full, and we expect no improvement of importance until the labor question in the colliery districts is settled. *Iron*—Scotch pig-iron is lower. Rails, both steel and iron, are about the same as a month since. Staffordshire is about 10/ cheaper. *Copper*—This metal has been neglected during the past month, and quotations are about £2 per ton lower than on the 1st of March. The charters for the West Coast continue moderate, viz., for the last half of February 1500 tons bars and ingots, and for the first half of March 1700 tons, of which 200 tons are destined for the United States. Smelters have made considerable purchases of furnace stuff during the past month at 15/9. per unit for ore; but the demand for tough and manufactured has been slow. Australian has participated in the general dullness. We quote Chili bars, £80; Wallaroo, £90; tough, £86 to £87; manufactured, £94 to £96."

The *Mining Journal* remarks: "*Copper.*—Just before the holidays the market was very quiet, and although there had not been any important change in quotations, yet the tendency appeared to be toward increasing weakness. For named brands, Chili bars, £79. 15/ cash had been accepted, and g. o. b. were done at £80 with three months' prompt; but upon the opening of business this week there appeared rather a better feeling, and on Wednesday upward of 200 tons Chili bars changed hands, best brands realizing £81. 10/, cash; g. o. b. £80 same terms, and 125 tons with three months' prompt, was also sold at £80, and 25 tons same, prompt, £80. 10/. Thursday's market was not so active, but prices remained unaltered. Today the market is steady; sellers are firm, and at the moment there is an improvement noted; £80. 10/ continues the current quotation for g. o. b. Chili bars, usual cash terms. English tough is quoted £86, and India, 4 by 4 sheets, £95. Yellow metal has been sold at 7⅝, which still remains the current quotation. Australian copper has been neglected; Wallaroo is is quoted £90. The demand for tough and manufactured has been as sluggish as for other descriptions of copper. Smelters have been supplying themselves with a fair amount of furnace material, at 15/9d. per unit for ore, and there is now hardly any ore in the country. *Lead*—The market has been very quiet, and drags on from day to day without animation. Good soft English pig is quoted at £21 to £21. 5/, and soft Spanish pig, without silver, 20. 15/, and with silver £19. 15. *Quicksilver.*—The market has declined, and quotations now rule at £15 per flask. *Tin.*—At the commencement of the week the market was very firm at £90 for Straits, but the amount of business transacted was limited. The published statistics showed that the deliveries of Banca and Billiton tin for the month of March were 6583 slabs in excess of the deliveries for the previous month, and stocks had increased by 9652 slabs, and there was a decrease in the quantity of tin afloat to the extent of 5000 slabs, so that, statistically, the position of the market was not very much altered. On Wednesday the Dutch Trading Company's sale took place, and 22,800 slabs of Banca were offered, and realized a price equal to about £91. 10/, laid down in London, and 3000 slabs of Billiton in like manner realized the equivalent of £89. 10/. These prices, as compared with those obtained in January last, showed a decline of £7. 10/. The result of the sale not being viewed as favorable, quotations drooped, but buyers were not willing to come in at a reduction. Yesterday it was evident that a sudden and smart relapse had occurred, and it was not until the price of Straits had receded to £86. 10/, that any transactions were reported. At this price 15 tons changed hands, and £87 was realized for 25 tons; 10 tons of Australian were sold at £86. 10/. To-day the market is steadier, at about yesterday's quotations. *Tin Plates.*—As the demand does not improve, and manufacturers' order books begin to show blank pages, quotations are easier, and some concession in price would probably be submitted to in many quarters with a view to securing a good order."

Messrs. Richardson & Co., Swansea, say: "Inactivity is still the characteristic feature of the copper trade, and there has been a general decline in prices since our last issue. A good business was transacted in furnace material about the middle of the past month, but a noticeable phase is that nearly the whole of the stuff arriving, and known to be on the way, is bought by smelters. There is hardly any ore in stock in this country, and the stocks of metal in Europe just now are quite 30 per cent. less than in 1873 or 1874. Such a circumstance hitherto would in all probability have brought about some speculation, but this latter seems to have entirely deserted our market."

Messrs. Harrington, Horan & Co., of Liverpool, March 31st, report that "since the 15th instant the market has been remarkably steady, and our quotations for Chili copper are unaltered. The most important features during the fortnight are the smelters' purchases of 200 tons regulus to arrive here at 16/3, 1660 tons regulus to arrive at Swansea at 16/3 and 1200 tons ore to arrive there at 15/9 per unit. Manufacturers and speculators have taken 1590 tons bar at £80 to £82 per ton, according to prompt and brand, at which rates there are still sellers. *Tin.*—Market firm. Quotations are: Straits £90, and Peruvian £70 to £78, as in quality. *Lead.*—Market dull at £21. 10/ for ordinary shipping brands. *Spelter.*—Market quiet at £23 to £23. 5/ for ordinary Silesian brands."

Latest Liverpool prices are:

Iron: f. o. b. in Liverpool, per ton.

	£	s.	d.	£	s.	d.
Merchant bar	8	15	0 @	9	0	0
Merchant bar, in Wales	8	5	0 @	8	10	0
Staffordshire	9	5	0 @	11	15	0
Hoop	10	10	0 @	11	10	0
Sheet	12	10	0 @	13	10	0
Nail rod	10	0	0 @	9	10	0
Bar, best crown	9	5	0 @	9	10	0
Boiler plates	12	0	0 @	13	5	0

Tin Plates: f. o. b. in Liverpool, per box.

	£	s.	d.	£	s.	d.
Charcoal, I. C.	1	14	0 @	1	17	0
Coke, I. C.	1	8	0 @	1	10	0

Copper: Delivered in Liverpool, per ton.

Bolt and Sheathing	£95 @	£96
Tile	88 @	00
Tough cake	90 @	00
Best selected	92 @	00

POSTSCRIPT.

SHEFFIELD, April 7.—A dispute is likely to arise between Joseph Rodgers & Sons and their spring knife cutlers, owing to the desire expressed by the firm to take off a payment, hitherto made to the men, or 1d. in the shilling as "file money." The men have held a full meeting to-day, and have unanimously resolved to support the outworkers, who are at present only dealt with, against any attempted reduction in prices.

Effect of the Pittsburgh Lock-out on the Western Iron Trade.

A correspondent of the Pittsburgh *Commercial*, writing from Cleveland, Ohio, on the end of the lock-out, discourses as follows regarding the way the news was received, and the effect of it upon the iron trade:

And there was rejoicing thereat. A great deal of "I told-you-so" expressions among puddlers who have been awaiting the turn of events, and now and then an exclamation to the effect: "The big buggers had to come down—they'd starve as soon as hus!"—a sullen indifference on the part of mill men, as all were running who could run profitably, but a pervading feeling of joy in the community at large. "The puddlers' strike is ended." "Is it?—how so?" "They've gone to work at Pittsburgh." "Good—now business will grow better soon."

So you notice that Pittsburgh is held in high esteem in our lake city, as a center of power which can influence business for the better or worse over a large extent of country.

The drop of the Iron Association was unexpected, as a general thing, yet your correspondent knows that it was seriously contemplated by some of our leading iron men to approach Pittsburgh with arbitration measures, and by this means help her out that she in turn might help out her neighbors. The mills here which did not pay the puddlers' rate, as well as those in the neighborhood, were as much under the control of Pittsburgh influence as if they had been owned and operated there.

Let us hope the matter is settled for a time, but it is the judgment of your correspondent that another trouble is not far distant, as sure as the moon is sure to change. Having gained one victory, the puddlers' or some other union will not be long in asking for another. The epidemic has not quite run out. I look for a weakening in the resolution of bituminous mine owners, who will soon begin to think they can pay the ten cents advance, although the price of coal in the markets—this market, at least—has not advanced, notwithstanding its scarcity.

Already has the price of pig iron stiffened under the influence of an expected demand. The gradual wearing away of the stock of bituminous caused it to go to $28 50 to $30 last week, on actual sales, but to-day $29 to $31 is offered for future deliveries, as if a scarcity or a rise was anticipated; but no sales were closed at these figures. No change in Lake Superior charcoal grades, except in the Morgan car wheel, for which $37 is offered; but as there is none in market no transactions were made.

The puddlers here are expecting to resume work in a day or two, at the Pittsburgh rate. All have been out, except those at the Lake Erie mill and the Cleveland Rolling Mill Company's rail mill, where harmony has existed in regard to price. In the valley—Mahoning—the idle mills have concluded to resume, if they can be provided with fuel.

While upon iron, it may be well to tell you that no contracts have yet been made with mining companies for Lake Superior ore for present or future use, and no ore is expected here except that which comes to furnaces direct, or to parties interested in mines and furnaces, and which, if not consumed by the parties themselves, will be subject to spot sales. The mining companies have curtailed their product all they can, without absolutely abandoning their work, and do not intend to forward any ore until it is sold. This is absolute. They cannot afford to do otherwise, after having sacrificed heavily on the over shipments of last season and the season before. The companies which had a large vessel tonnage chartered ahead, including this season, have compromised with owners, by buying off, and by giving security to furnish a certain number of cargoes this and next and the following season, thus dividing and extending over the time originally agreed upon, so that these charters will not trouble them, nor by them will they be compelled to pay demurrage or work their mines and ship ore at a loss.

Most of the shops and mills are fairly busy—some of them, operating on specialties, are driven; and the industrial interests of the place are regarded as being in a healthy tone.

A New Marine Engine.

The following description of a novel marine engine will, I do not doubt, be of considerable interest to many of your subscribers:

During the last few days some very interesting experiments have been made with a steam launch belonging to Sir Gilbert Clayton East. The boat itself is not new, having been built some four years ago, by Messrs. Forrest, of Limehouse, and was then fitted with engines for driving twin screws, by Messrs. John Penn & Sons, the eminent marine engineers of Greenwich. Her owner, however, finding that the two propellers were constantly becoming entangled with weeds, applied a short time ago to Messrs. Penn to supply him with a new engine to drive a single screw, as less liable to that inconvenience. In order to make more cabin accommodation, Sir Gilbert East gave directions that the engines should be fitted very far back in the stern, so far back, indeed, as to render the application of an ordinary launch engine impossible, and at the suggestion of Messrs. Penn he decided to make use of a new engine, recently patented by Mr. P. W. Willans (a gentleman connected with Messrs. Penn's factory), which could be easily placed in the limited space in the stern. The work connected with the fitting of this engine on board the boat has just been completed, and the result of the few short runs she has made on the river have been most satisfactory. Mr. Willans' engine is constructed with three cylinders, and the only working parts are three pistons, three connecting rods, and a three-throw crank axle. These are enclosed in a cast iron casing, so that nothing can be seen of the engine itself, except the two ends of the axle, which appear through the casing. The cylinders are placed side by side, and it is by a system of ports, which connect the cylinders one with the other, together with a peculiar construction of piston, that the piston of one cylinder acts as a slide and admits steam to the next, or the third cylinder. All these ports meet in a three-way cock, and by turning this cock the direction of the steam is altered and the engine is stopped or reversed with marvelous rapidity. It will thus be seen that all slides, eccentrics, link motion and other complicated reversing gear are done away with; there is no exposed machinery to catch dresses, no oil or grease flying about, and none of the disadvantages which make steam engines in small boats so disagreeable. Beside this, the engine is so simple that it is completely under the control of any one, and is so compact that it can be lifted in or out of the boat by two men. Two men can also take it to pieces, examine every part, and put it together again in less than an hour. The steam acts on one side of the piston only, and as the pressure is always downward, the engine is perfectly noiseless. By means of a very simple arrangement the engine is made to work expansively, and cuts off at five-eighths of its stroke. Though in this particular case more than 380 revolutions per minute is not required, yet an engine of the kind has been constructed to make 1000 revolutions, and at these great speeds, by allowing a small quantity of oil to remain in the bottom of the casing, the lubrication of the working parts is perfect, and such a thing as a hot bearing is unknown. The diameter of the cylinders of the engine under notice is 7 inches, the stroke being the same, and with 90 lbs. of steam and 380 revolutions the indicator cards showed a little under 40 horse power. The weight of the engine by itself is 7 cwt. No reliable trials of the speed of this boat have yet been made, but she steamed from Limehouse to Erith, a distance of 13 miles, the other day, in 75 minutes, against a slack tide. As the mean draught of the boat is one-seventh greater than it was with the old engine, in consequence of the additions to the cabins, and as the trim of the boat is considerably altered, it would be scarcely fair to draw a comparison between the speed with the twin screws and with the new engine. Many engineers of eminence have inspected the engine at work, and have expressed themselves greatly pleased with its arrangement and performance. The length of the boat is 50 feet, beam 7 feet 4 in. The engine was made for Mr. Willians by Messrs. Tangye, of Birmingham, and Messrs. Penn supplied and fitted the boiler, propeller shafting, and other gear.

Wonderful Retention of Heat.

The Virginia City (Nevada) *Enterprise* says:

On the 30th of October last, about two o'clock in the afternoon, the large new airshaft of the Belcher mine, then connected to the 1000-foot level, took fire and was destroyed. The timbers of the shaft all burned out, and the rock fell in and blocked it up. After mature deliberation it was thought that it would be better and cheaper to sink a new shaft than to try to clear out the old one, so badly were its sides caved and so great was the quantity of rock that had tumbled into it. The new shaft was sunk a short distance to the west of the old one. It has now reached a point near the 1000-foot level where it will be continued down on an incline. The incline was started at the 1000-foot level and carried up to meet the vertical portion of the shaft. The course of this incline carried it through the remains of the old vertical shaft, but as soon as it was lapped the men found they could do nothing in it on account of the ashes, burnt earth and rocks that poured down into their incline. A tunnel was then run until it had reached a point a short distance west of the old shaft, when a vertical upraise was made to the line of the proposed incline to be run up to meet the new shaft. The men then began working down on the incline in order to reach the point from which they were driven in trying to come up. They have succeeded in getting into the bottom of the old shaft, where, much to their surprise, they find the rock still red hot. In trying to put in timbers they were set on fire, and in order to work at all it is found necessary to bring a line of hose into the place and play a stream of water upon the rocks wedged in the bottom of the old shaft. There is no timber on fire among the rocks. They seem to have been heated to a degree so intense at the time of the fire, that they have remained red-hot ever since. When we find so small a mass of rocks as can be contained in the bottom of a shaft remaining red-hot for over five months, after having been heated to whiteness, should we be incredulous on being assured by scientists that the center of the earth, once a molten mass of rock, still remains in a molten state after untold ages? Nearly three years after the great fire in the Yellow Jacket mines, places were found in the lower levels where the rock was still nearly red-hot.

A Street in Constantinople.

A correspondent of the London *Daily Telegraph*, writing from Constantinople, says: "Spite of its dirt and squalor, the Grande Rue is interesting. It is the scene of a movement almost unexampled in Europe. Turks and Greeks, Albanians, Armenians, Circassians, Nubians, Arabs, Maltese, English, French, Russians, Germans, all the nationalities of the world, in fact, help to make up its population. Over its rough, slimy stones passes up and down a ceaseless stream of humanity, now forced for a moment to stop that the carriage of some Grand Pasha, with its outriders, may find a passage; now giving way to a body of Turkish soldiers, who march as if they were flying in disordered retreat from a field of battle; now driven pell-mell before a dashing officer on horseback, who never dreams of drawing rein, although women and children are in helpless confusion before him; and now fighting their way between the uncouth wheels of a timber laden vehicle, drawn by buffaloes, whose spreading and pointed horns threaten to transfix the poor pedestrian if by chance he escapes being crushed beneath the burden they are hauling. Here comes a jolting hack, dignified with the title of carriage, filled with Turkish women, in blue and pink silks, their faces covered by the muslin folds of the *yashmac*. If you can get a good look at them *en passant* you will not be fascinated by their beauty, for the half veil, although most seductive, is now worn so thin as scarcely to conceal the thick noses, gross lips, and flabby faces of these beauties of the harem. They are 'going shopping'—probably to purchase French jewelry at double its value, to adorn their persons for the benefit of the Pasha, their master, and their fellow associates of the harem, for, excepting these, no society do they enjoy. Here, in contrast to them, are some Turkish women on foot, accompanied by their servant, a fat old black woman, who is also concealing her Nubian loveliness beneath a *yashmac* of snowy muslin. These, perhaps, are the wives or concubines of a tradesman, or they would not be on foot. They are wrapped in *ferigees*, or flowing mantles, of brightly dyed cotton cloth—purple and green and crimson—the effect of which, with their yellow slippers, is very picturesque. They turn their eyes away as they pass us, for to look upon a man, and, least of all, a 'dog of a Christian,' would be a most unhallowed proceeding."

The Penetrating Power of Heavy Guns.

The London *Standard* has an article about big guns which gives some startling facts. It says: "England is now building a ship to carry twenty-four inches of armor, and she is making a gun which will be eighty-one tons in weight. Unquestionably, the ship is splendidly designed. So also is the gun, which we are to have ready some time about next July, and which will doubtless turn out to be a wonderful weapon. Artillerists speak of the coming monster as 'an awful gun.' Crowds assemble at the forge whenever one of the huge coils is to be pummeled by the new steam hammer at Woolwich Arsenal. Even in the making of the 38-ton gun, masses of iron weighing twenty-eight tons, at a welding heat, have to be laid under the hammer. For the larger gun an incandescent mass of forty tons has to be fetched out of the fire and duly hammered. The furnace has the capacity of a cottage, and the tongs by which the glowing cylinder is lifted out of its burning bed weigh no less than thirty tons. A steam crane bears the whole weight of tongs and coil, and everything proceeds without accident or hitch of any kind. At night the sight is truly grand, and well repays those spectators who take the trouble to be present.

"This great gun, which is being constructed at Woolwich Arsenal, has a bore of sixteen inches diameter and twenty-four feet in length. It will fire a ball weighing 106 pounds, propelled by 300 pounds of powder, the range being seven miles." But the *Standard* says this is not all that can be done, and, after speaking of the practicability of a twenty-inch bore, it asks: 'Why should we stop short of that which must be gained at some period or other? Let us contemplate the further step at once. Why not have a gun with a bore of 24 inches—simply two feet? The weight would be 275 tons, the charge of powder would be 1000 pounds, the weight of the projectile nearly two tons and a half, and the range eight or nine miles! This is not a mere dream, but a perfectly practicable piece of work. The cost would probably be a trifle less than $500 per ton, or about $125,000 for the entire piece. In weight of projectile, such a gun would probably be something more than a 5000-pounder. Perhaps, when we had made such a gun, we might think we had gone far enough. As for the armor, the projectile of the 275-ton gun would penetrate three feet of iron, with corresponding backing. The length of its bore would be 36 feet; that of the 'Woolwich Infant,' of 35 tons, is 13½ feet, the bore of the 38-ton gun being three feet longer. The 81-ton gun, as already stated, will have a bore of 24 feet. The 'Woolwich Infant' has a maximum external diameter of rather less than 5 feet. The 81 ton gun will measure in this respect 6 feet; but the 275 ton gun would measure 9 feet. Such would be its full hight if lying flat on the ground. A tall man would come a yard short of the top of the gun, the latter simply lying on the bare earth without a carriage." The *Standard* intimates that this will be the most popular gun ever to be used.

Regularity of Ocean Passages.

In this busy age, when Europe and America are closely joined by mercantile ties, it becomes daily more necessary that ocean steamers should not only be swift, but also so regular in their passages from port to port that the traveler stepping on board at New York can tell within a few hours when he will arrive at Queenstown or Liverpool. Our attention has been attracted to this subject by the perusal of a statement of the passages of the new Inman steamships City of Chester (5566 tons) and City of Richmond (4607 tons), covering the whole of the year 1874, when the vessels were subjected to all the different phases of the variable Atlantic:

City of Chester.				City of Richmond.			
Voyages.	D.	H.	M.	Voyages.	D.	H.	M.
First	8	1	38	First	8	11	53
Second	8	5	58	Second	3	2	38
Third	8	11	28	Third	8	9	43
Fourth	8	2	8	Fourth	8	18	23
Fifth	8	4	33	Fifth	8	7	13
Sixth	8	6	8	Sixth	8	21	48
Seventh	8	8	38	Seventh	8	3	48
Average	8	5	47	Average	8	10	38

This table shows that in no case was either of these steamers nine days going from New York to Queenstown; so that a passenger embarking on the City of Chester or City of Richmond could make an appointment to dine with a friend in London ten days later, with a reasonable certainty of keeping it. This remarkable regularity is, no doubt, a result of the superior size and weight of the steamers as compared with those built years ago, together with the increased power of the machinery which drives the enormous vessels through the water steadily, and with irresistible force.

A Lubricator for Machinery.—A Frenchman named Persoz has invented the following method of preparing a superior lubricator. Grease, or what is better, the fatty acids, or even rosin, are dissolved in different proportions in the heavy mineral or coal-tar oils. The liquid mass is then saponified, to give it the necessary consistency, by the addition of a solution of alkali. The best materials are the crude oleic acid from the manufacture of stearic acid, and caustic soda or quick lime. As oleate of lime melts at a moderate temperature, when in contact with moving machinery, it becomes soft and acts like ordinary lubricators; the oleate of soda, on the contrary, does not possess this property; so by varying the relative proportions of soda and lime it is easy to regulate the fusibility of the lubricator according to the season of the year and the kind of machinery on which it is to be employed. By varying the quantity of fatty acid employed, the consistency may likewise be varied. In preparing the lubricator the oleic acid is added to the heavy oil, stirred, the requisite quantity of alkali solution quickly poured in and again stirred until the whole mass is saponified, which takes place in a few minutes. A portion of the water in which the alkali was dissolved remains in the mass, the remainder swims on top and can be poured off. By the addition of some rosin to the heavy oil the product will have more consistency with the same quantity of oleic acid, but it must be added with caution as it makes the lubricator very sticky. Persoz further remarks that his process is adapted to the rapid preparation of soda and potash soaps. For this purpose the oleic acid is to be dissolved in a light oil, saturated with a kali, and the solvent distilled off, or drive out by steam.

Purification of the More Easily Fusible Metals by Filtration.—If the substance of which a filter is composed has no attraction for the particles of the liquid to be filtered—*i. e.*, is not wetted by it, the interstices of the filter do not act like capillary tubes, and the liquid will not pass through. Mercury will not run through a very fine sieve of iron or copper wire unless the wire is amalgamated. If the wire be amalgamated, although the meshes be very fine, the mercury will pass through easily, while any pieces of iron, copper or amalgam will be retained on the filter. Lampadius, formerly Professor of Metallurgy in Freiburg, has attempted to make use of this principle in purifying the easily fusible metals, and with what success the following will show: Tinned sheet iron, as thin as paper, was cut into strips 6 inches long and 4 inches wide. Five hundred of these were placed face to face and fastened in an iron frame, with wedges driven in to bring them closely together. This frame was luted into the bottom of a graphite crucible. Some impure Bohemian tin was melted in another crucible, and allowed to cool until crystals began to form on the surface, when it was dipped into the filtering crucible. The tin, which was still fluid, ran through almost chemically pure, while a pasty magma remained on the filter, which contained iron, arsenic and copper chemically combined with tin.

We invite attention to the announcement under special notices of Charles P. Gladwin, Philadelphia, who makes a specialty of Furnace and Foundry *outfits*.

Government Tests of Iron and Steel.

The Pittsburgh *Commercial* says:

Reference has already been made to the appropriation by Congress of the sum of $50,000, for the purpose of conducting experiments to test the strength of American iron and steel, and their adaptability to the various uses to which they are applied. The act is much more important than a superficial glance might indicate, as it will settle questions of the greatest moment to American interests. For instance, the relative strength of English and American iron and steel has never been officially or satisfactorily determined, and the relative adaptability of these metals for mechanical, architectural, and other purposes, is yet unsettled. The interest in these experiments is not confined to iron workers merely. The whole country is more or less concerned in and affected by them. Every person who travels on a railroad is interested in the strength of the rail, the car wheel, the axle, the engine, the boiler, or whatever else tends to secure safe passage. So the strength of the boiler plates, the cylinders, the flues, the shafts, and other parts of the machinery of a vessel, is all important to those who travel or ship goods by water. The iron columns, girders, etc., which are relied on to support the railway station, the church, the theatre, and other public buildings, may be either too weak, thus endangering life, or may be needlessly strong, thus incurring waste and adding dead weight. To determine the resisting force of iron and steel, when applied to these various uses, and to give accurate data for the guidance of scientific and practical men, are matters of paramount importance. Some of the most eminent engineers in the country regard the act as likely to confer greater benefit upon American interests than any other act of the last Congress. It provides as follows:

"That for experiments in testing iron and steel, including the cost of any machine built for such purpose, the sum of $50,000 is hereby appropriated; and the further sum of $25,000 provided 'for improved machinery and instruments for testing American iron and steel' in the act entitled 'An act making appropriations for the support of the army for the year ending June 30, 1874,' approved March 3, 1873, is hereby continued and made available for such purpose, and that the President be, and hereby is, authorized to appoint a board, to consist of one officer of engineers of the United States army, one engineer of the United States navy, and three civilians, who shall be experts, and it shall be the duty of said board to convene at the earliest possible moment, at such place as may be designated by the President, for the purpose of determining by actual tests the strength and value of all kinds of iron, steel and other metals which may be submitted to them, or by them procured, and to prepare tables which shall exhibit the strength and value of said materials for constructive and mechanical purposes, and to provide for the building of a suitable machine for establishing such tests: *Provided*, That no officers in the pay of the Government shall be entitled to or receive any additional compensation by reason of any service rendered in connection with this board; but one of the civil experts shall act as secretary of the board, and shall be entitled under this act to such compensation as the President may deem proper and fit: *Provided*, That not more than fifteen thousand dollars of the sum provided shall be used for the expenses of such board."

After due consultation with the Secretary of War and the Secretary of the Navy the President has appointed the following board of officers as is provided for in the above act, viz.: Lieut. Col. T. T. S. Laidley, U. S. A.; Commander L. A. Beardsley, U. S. N.; Lieut. Col. Q. A. Gilmore, U. S. A.; David Smith, chief engineer U. S. N.; Gen. Savoy Smith, civil engineer; Prof. R. H. Thurston, of the Stevens Institute of Technology, of Hoboken, N. J.

The board is a remarkably strong one, and will, no doubt, be able to demonstrate that American material is superior to foreign, and also furnish American engineers the data necessary to use constructive materials intelligently and economically.

It is not stated where the experiments are to be conducted; but certainly no more suitable or accessible point could be selected than Pittsburgh, the center of the iron trade. It has been suggested, also, that the Allegheny Arsenal buildings would furnish most admirable facilities for conducting the experiments.

On the Welding of Iron.

BY A. LEDEBUR.

If two pieces of wrought iron or steel with clean metallic surfaces be pressed forcibly together while in that pasty state which is intermediate between the solid and liquid condition, they unite to form a single piece. If a stream of liquid cast iron be permitted to flow upon a clean metallic surface of a piece of warm cast iron and cooled slowly, it unites with the casting to form a single piece. The former operation is known as welding wrought iron, the latter is called welding cast iron. The ability to weld cast iron enables us to replace the injured or broken part of a casting, as for example, of a broken axle or journal on a roller, with a new one.

Numerous theories, and some of them very elaborate, have been devised to explain the welding of wrought and of cast iron. It has, however, seldom been observed that a series of entirely analogous processes are going on about us every day in common life, for which no explanation is sought, and to which the explanations of welding would fill fit.

W. M. Williams, in *Iron*, July, 1874, mentions the analogy between welding wrought iron and sticking together two pieces of shoe maker's wax, or of putty, clay and glass. Putty and clay, strictly speaking, furnish no parallel to iron. Both consist of a large number of single particles, diminutive, to be sure, but still independent bodies, which owe their adhesive power to their admixture with water or glycerine. It is well known that liquids often possess considerable adhesive power for solids; this adhesive force causes putty, clay, molding sand in foundries, &c., to hang together. But a piece of iron forms a single, perfectly homogeneous body, and in welding iron comes directly upon iron. On the other hand, I might mention wax and glass as specially showing characteristic analogy to the welding of iron. Both substances, when cold, are hard and brittle; but they permit of the union of several pieces into one as soon as the brittleness is removed by warming, whereby it is possible for a change of form to take place in such a mass by pressing, squeezing or pounding without the body being broken, torn or split.

Those substances which do not change gradually but suddenly, from the solid to the liquid condition furnish analogies to the welding of cast iron. I may mention as examples water and stearine. If water is allowed to flow upon the surface of ice until the upper surface, which is usually impure, begins to melt, and then the water is allowed to freeze on the ice, it unites with it to form one piece. The formation of icicles on our roofs offer an conspicuous example, and the same process can be seen daily on our stearine candles as they melt and run down.

I believe that all these operations, including the welding of wrought and cast iron, can be referred to a single and very simple law of nature.

Every solid body owes its state of aggregation to the cohesion of its molecules, that is, to the attractive power between them, which prevents the body falling apart. If a solid is separated into two pieces by rending, splitting, cutting, or the like, the cohesion of the surfaces separated is forcibly destroyed, and it is not possible to reunite these pieces by simply putting them together again, because,

1st. Pressing them together with a force sufficient to restore the cohesion of the separated molecules would, in most cases, shatter the solid body.

2d. The separated surfaces have suffered some mechanical change, like the breaking off of splinters, which, although too small to be seen by the naked eye, prevent the surfaces from fitting perfectly on one another.

3d. Chemical changes, such as oxidation, at once change the original character of the surfaces.

If these obstacles to the union are removed, the cohesion between the molecules of the two parts again begins to act. If, for example, two pieces of plate glass are laid together, it is often impossible to separate them again without breaking them. But it must be born in mind that two plates of glass never possess absolutely flat surfaces, but always have inequalities, extremely small indeed, but considerable as compared with the size of the molecule, and they act against cohesion.

When it is possible, however, by strongly pressing together similar bodies, which are either soft naturally or have been rendered soft and ductile by heat, to bring the molecules as closely together as they are in an undivided body, the law of cohesion begins to act between the molecules of the previously divided body, and they form one piece.

If we have two bodies composed of the same material, which are naturally brittle and possess the property of passing suddenly from the solid to the liquid condition, like cast iron, water, and stearine; and if we bring one of these, while in the liquid state, into direct and continuous contact with the second, which is warmed almost to the melting point, and thus permit an intimate contact between the molecules of both, they also unite into one piece.

When two pieces of lead, which is a soft, ductile metal, have the clean metallic surfaces placed in contact and then hammered, they unite in the cold to a single piece.

When two pieces of glass are heated sufficiently to entirely destroy its brittleness and form a soft plastic mass, they unite with the slightest pressure to form one piece.

With wrought iron a white heat is necessary for union. It is only at a white heat that it becomes perfectly plastic so as to change form easily, and, beside, at this temperature another object is attained; iron when heated in the air immediately becomes covered with a film of oxide, which would entirely prevent the joining of the two pieces by welding. The complete removal of this film of oxide is the first condition for the success of welding. This is accomplished by strewing quartz sand over the oxide, forming an easily fusible slag, and this slag is squeezed out by heavy pressure or hammering of the pieces brought together. This squeezing out of the slag can only succeed when the iron is soft enough to permit it go through, and on the other hand, the slag first becomes sufficiently fluid at a high temperature.

Welding cast iron is more difficult than welding wrought iron or steel. Here another condition comes in; the liquid portion, being heated much higher than the other and solid part, contracts in a different ratio, and this difference in contraction may easily cause a separation of the two parts after they have united. Further, where the solid and fluid metals touch, the molecules do not adjust themselves to one another so well as when two soft pieces are pressed together, and the liquid iron is, in fact, chilled when solidified suddenly by the cooler portion abstracting so much of its heat. On the one hand the molecules in the solid iron are closer together than in the liquid iron, and on the other hand it is known that when cast iron solidifies, and when it melts, too, changes take place which very probably affect the atomic composition of the molecules. For this reason the principal condition in welding cast iron is to conduct an uninterrupted stream of liquid iron over the spot to be welded until the surface of the latter begins to melt.

I might here mention another operation, which may doubtless be referred to similar causes, namely, uniting metals and other bodies by soldering, cementing and gluing. Here, too, an account of the liquid condition of the uniting substance, which afterward becomes solid, there is an intimate arrangement of the molecules of the body to be joined and the joining substance, and hence a mutual attraction of these molecules is produced. The attraction between unlike molecules is called adhesion, to distinguish it from the attraction between like molecules, which is called cohesion. Also, in this kind of union of several bodies, the object can only be attained when no considerable change of volume (contraction) takes place as the joining substance solidifies, whether by cold or chemical change, and when the surfaces to be joined are perfectly clean. Hence the use of borax, sal-ammoniac and soldering fluid to remove the oxide of metals to be soldered. Not unfrequently a well made joint is stronger than the substances joined.

Cement for Metal and Glass.—To cement metal to glass, mix two parts of powdered white litharge and one part of dry white lead into a dough, with boiled linseed oil and lac copal. Coat the metal with this cement, and gently press the glass into it. Litharge when mixed with glycerine makes a very strong cement provided the glycerine be pure and free from water. This latter mixture has been recommended for making glass stoppers tight in bottles, but it was discovered that when they were put in with it they utterly refused to come out, the mixture forming a very good cement. Its uses are very wide.

London Metal Market.

(From The Mining Journal.)

	£.	s.	d.	£.	s.	d.
Copper—₱ ton.						
Best Selected	89	0	0		—	
Tough Cake & Tile	87	0	0		—	
Sheathing and Sheets	93	0	0		—	
Bolts	95	0	0	93	0	0
Bottoms	95	0	0	93	0	0
Old	89	0	0	84	—	
Australian, Wallaroo	90	0	0		—	
" other brands	88	0	0	89	0	0
Chili bars, g. o. b.	80	0	0	81	10	0
Wire ₱ lb.	0	1	0		—	
Tubes "	0	1	¼		—	
Brass—₱ lb.						
Sheets	0	0	9¼	0	0	10¼
Wire	0	0	9¾	0	0	0
Tubes	0	0	12	0	0	12½
Yellow Metal Sheathing	0	0	7¾	0	0	8¾
Sheets	0	0	7¾	0	0	7¾
Spelter—₱ ton.						
Foreign on the spot	23	7	6	0	0	0
" to arrive	23	10				
Zinc—₱ ton.						
In Sheets	30	10	0		0	0
Quicksilver—₱ bottle	15	0	0			
Tin—₱ ton.						
English Blocks	94	0	0		0	0
Ditto Bars (in bris.)	95	0	0		0	0
Ditto Refined	96	0	0		—	
Banca	95	0	0		—	
Straits	86	10	0	87	10	
Australian	85	0	0	88	0	0
Tin Plates—† ₱ box.						
IC Charcoal 1 qual.	1	18	0			
IX " 1 qual.	2	4	0			
IC " 2 qual.	1	16	0	1	17	0
IX " 2 qual.	2	2	0	2	3	0
IC Coke	1	6	6	1	7	6
IX "	1	12	6	1	13	6
Canada Plates ₱ ton.	18	10	0	19	0	0
" at works	18	0	0	18	10	0
Iron—₱ ton.						
Bars Welsh, in London	8	15	0		—	
" to arrive	8	12	6	8	15	0
Nail Rods	9	5	0		—	
Nail Rods, Staff'd in L'don	10	0	0		—	
Bars	10	0	0	11	0	0
Hoops	11	0	0	12	0	0
Bars at Works	9	0	0	11	0	0
Hoops ditto	10	0	0	11	10	0
Sheets, single, and plates	12	0	0	13	10	0
Pig, No. 1, in Wales	5	0	0	6	10	0
Refined metal ditto	7	0	0	8	0	0
Bars, common ditto	7	15	0	8	0	0
Do. merchant, Tyne or Tees	8	0	0	9	10	0
Ditto, Railway, in Wales	6	15	0	8	0	0
Ditto, Swedish, in London	16	0	0	17	5	0
To arrive	17	0	0		—	
Pig, No. 1, in Clyde	3	12	6	4	17	6
Ditto, f.o.b., Tyne or Tees	4	0	0	4	5	0
Ditto, Nos. 3, 4, f.o.b.	3	10	0	4	0	0
Railway Chairs	5	0	0	5	5	0
" Spikes	12	10	0	14	0	0
Indian Ch'coal Pigs in L'don	8	0	0	10	0	0
Steel—₱ ton.						
Swedish, in kegs (rolled)		—			—	
Ditto (hammered)	19	0	0	20	0	0
Ditto, in faggots	20	10	0			
English, spring	19	0	0	24	0	0
Lead—₱ ton						
English Pig, common	21	0	0		—	
Ditto, LB	21	5	0			
Ditto, WB	21	0	0			
Ditto, Sheet	21	10	0			
Ditto, Red Lead	24	0	0			
Ditto, White	30	0	0	32	0	0
Ditto, Patent Shot	26	0	0		—	
Spanish	20	10	0	20	15	0

* At the works, 1s. to 1s. 6d. per ton less. Terne plates 2s. per box below tin plates of similar brands.
† Add 6s. for each X.

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Lamp Collars and Sockets,
Kerosene Oil Burners,
Corset Steels,
Brass Hand Lamps, &c., &c.

Sun Burners,
Brass Tubing,
Brass and Copper Wire,
Copper Bottoms,
Iron and Tinned Rivets,
Brass and Japanned Oilers,
Tin Tobacco Boxes,
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To Glass and Steel Manufacturers, Varnish Makers and others we offer our brands of Manganese, which have become well known to consumers during the past eighteen years as the most reliable in the market.
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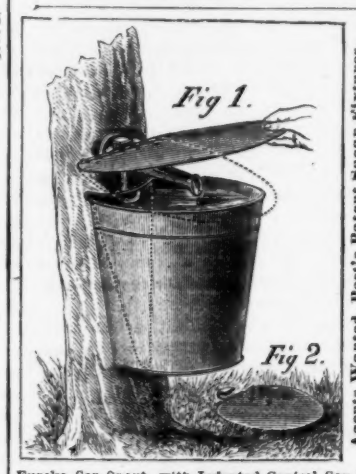
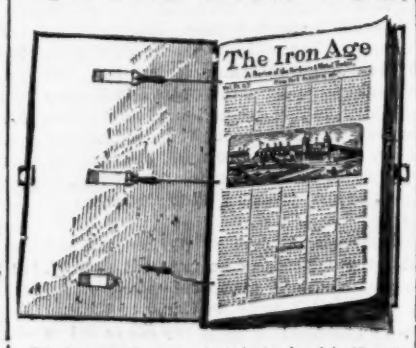


Eureka Sap Spout, with Indented Conical Sap Bucket and Cover attached.

Agents Wanted, Post's Patent Sugar Fixtures. EUREKA SAP SPOUTS, and price list sent postpaid for 20 cents. Address, C. C. POST Burlington, Vt.

Get Binders
FOR THE IRON AGE.



We have made arrangements to furnish Kochi's PATENT BINDER, which we think altogether the best before the public, to our subscribers at the following very low rates—about the wholesale prices by the dozen.

Half Cloth ..... $1·00 each.
(Cloth Back and Corners, with Morocco Paper Sides—a good, serviceable Binder.)
Full Cloth ..... 1·50 "
(Morocco Cloth Back and Sides.)
Half Roan ..... 1·75 "
(Roan Back; Cloth Sides.)
Half Morocco ..... 2·00 "
(Morocco Back and Corners; Cloth Sides.)

The above are all in black, which is the most serviceable color, with the exception of the Half Morocco, which are put up in a number of handsome shades. The name of the paper is stamped in gold on either side, and each Binder is furnished with loops by which it can be hung up against the wall as newspaper files are usually disposed of.

The Binders will each hold the twenty-six numbers in the form of a bound volume. They can be nicely inserted in two or three minutes by any boy of ordinary intelligence; and when the covers are full they can be either preserved in that shape as bound volumes of *The Iron Age*, or they can be emptied and used again. There is no possibility of their getting out of order, unless the cords, which are very strong, wear out, when anyone can easily replace them with a piece of fishing line or other suitable string. Subscribers who value the paper should order them at once, so as to keep the paper in good order

On receipt of the price we will ship them, safely put up, by any express line or to any New York house to be packed. They are too large to be sent by mail.

NO MACHINERY, Cannot get out of Order.
SELF COILING
TRADE
MARK
SHUTTERS
ABSOLUTE PROTECTION, Simplicity of Action.

CLARK & CO.'S
PATENT
Self-Coiling, Revolving
STEEL SHUTTERS
FOR
Store Fronts & Rear Windows.
FIRE AND BURGLAR PROOF.
Also, SELF-COILING
Wood Shutters
In various kinds of wood, suitable for Store Fronts, Private Houses, Offices, and School Partitions.
The Best & Cheapest Shutters in the World.
All Real Estate owners are invited to inspect them at the factory,
218 West 26th Street, New York.
JAS. G. WILSON, Manager.
Chicago Office, 54 La Salle Street.

Grain Scoops
AND
Back Strap Shovels,
WITH
PATENT
CORRUGATED
STRAPS,
An improvement giving great strength to the weak point of ordinary shovels. The corrugation is from A to B on both sides, not sensibly increasing the size of handle.
Hardware buyer's attention is called to the fact that this improvement will command the market.
We are prepared to fill orders for Ames', Rowland's, and Myers & Armor's Scoops and Back Straps, with the patent Corrugated Straps, at 75 cents per doz., net, above *prices of regular goods*, shipping direct from the factories. Samples orders asked.

Semple, Birge & Co.,
13 South Main St., ST. LOUIS, MO.
Sole Western Agents.
The Livingston Horse Nail Co.,
95 Reade Street, NEW YORK.
Sole Eastern Agents.

The Hartford Foundry & Machine Co
Successors to the
Woodruff & Beach Iron Works,
HARTFORD, CONN.
J. S. Hunter, Prest. E. J. Murphy, Treas. & Sec.
High and Low Pressure Marine & Stationary
STEAM ENGINES AND BOILERS,
Mining, Powder & Paper Mill Machinery,
And every variety of Iron and Composition Castings made to order.
The following are a portion of the Engines manufactured at these works, and are a sufficient guarantee of our capacity for doing first-class work, viz.: The Pumping Engines in the cities of Brooklyn, N. Y.; St. Louis Mo. and Hartford, Conn., and in the Charlestown, Mass. and Norfolk, Va. Navy Yards, and the engines in the U. S. Steam Sloops of War Michigan, Kearsarge, Manitou, Minnetonka and Piscataqua and the Gun Boats Cayuga, Pequot and Nepsic, the Government Transports Dudley Buck and Geo. C. Collins, and the Steamships America and United States. Also the large Horizontal Engine for the new Plate Mill of the Bay State Iron Co.

TACKLE BLOCKS.
BURR & CO
Manufacturers of Waterman and Russel'
PATENT IRON STRAPPED BLOCKS,
ALSO, MANUFACTURERS OF
ROPE STRAPPED BLOCKS,
21 PECK SLIP, NEW YORK

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YOUNGSTOWN, OHIO,
Manufacturers of
SPRAGUE'S IMPROVED
Sectional Sash Weights.
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STANDARD
32 Cal.
Just Out.

Prices Reduced for Little Joker, STANDARD, Paragon, Tycoon & Whitney's Revolvers.

ILLUSTRATED CATALOGUE of

GUNS, RIFLES, PISTOLS, MATERIAL,

Shooting Tackle, &c., furnished to DEALERS only.

P. O. Box 5380. SCHOVERLING & DALY, 84 and 86 Chambers Street, N. Y.

HERCULES IRON CUTTER.

No. 1, weight 16 lbs., cuts ⅜x2 inch, or ½ inch round or square.....Price $25·00
No. 2, " 165 " ⅝x3 " ¾ " " ..... " 50·00
No. 3, " 350 " ¾x4 " 1 " " ..... " 75·00

This is by far the most powerful Iron Cutter in use which can be worked by hand, having three times the capacity of any other machine which sells at the same price. The No. 3 machine occupies a space of 12x30 inches; when in use additional space must be had for the lever to work in. We send two sets of knives with each machine—one for square and flat, the other for round iron and steel. By using the knives adapted to it, round iron is cut without being flattened. One man can cut the largest size iron named above, but two would be required for steady work. It does not take a minute to change the knives or to shift the machine from large to small sizes.

AUGUSTA, GA., March 3, 1875.

MILLERS FALLS CO.—Enclosed find draft for amount of invoice, January 7. We would have sent the amount before, but did not have an opportunity of trying the Iron Cutter until a few days ago. It is one of the best machines we ever saw. Yours, truly, MOORE & Co.

Office of the ATHENS FOUNDRY AND MACHINE WORKS,
ATHENS, GA., February 18, 1875.

H. L. PRATT, President.—Dear Sir: Enclosed find draft made payable to your order by Messrs. Childs, Nickerson & Co., in payment for Iron Cutter. We have put our Cutter to good service, and find it cuts readily 1⅛ round, and 3⅛ x ⅝ square iron. C., N. & Co. are pleased with theirs, say it will save many a blow and cold chisel in their iron house.

Truly, yours, R. NICKERSON, Agent.

We make a satisfactory discount to dealers, and warrant the cutters to do all which we claim for them. Send for prices.

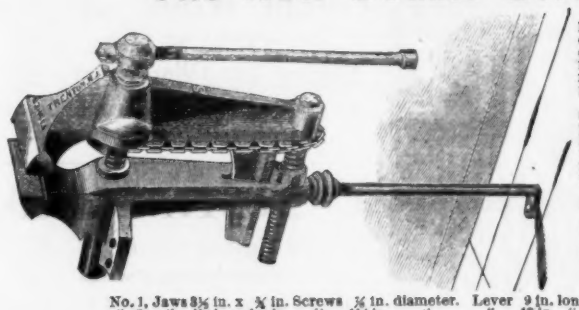
Millers Falls Company,

No. 78 Beekman Street, New York,

Sole Proprietors and Manufacturers of the

Barber Self-Fitting Bit Braces, Millers Falls Vises,
Improved Angular and Ratchet Drilling Machines,
TUBE SCRAPERS, FAMILY TOOL CHESTS,
Paten ustable Tool Holders, Mitre Boxes, Ratchet Braces, Breast Drills, etc.

The New Double Screw Parallel "Leg" Vise.



We are now ready to furnish, as the result of more than thirty years' experience, our latest style of Vise—the best yet made. It is **stronger** than any other, whether of Foreign or of American make; always parallel and holding with a tighter "grip." The jaws are of convenient shape for the workman to get near his work equally well for filing or chipping, instead of the heavy, clumsily formed jaws of the cast iron Single Screw Vises of the common "parallel" type, and which, depending upon slides alone for preserving parallelism, can never be screwed up very hard without "jamming" on the slides or breaking.

Our New Vise combines all the advantages of the "Peter Wright" Leg Vise, of strength and lightness, fastening to the floor and bench, and at the same time greatly superior to it; is always perfectly parallel at all points of opening, and never gets out of line. Embodying the same general principle as the well known Chain Vise, so long made by us, we have by new, scientific proportioning of all the parts, and with our recently improved metals for their manufacture, obtained so perfect a tool, that we now *warrant* these Vises for *three years* from date of manufacture stamped upon each.

The Jaws are of best Tool Cast Steel, welded on, file cut and properly hardened. The screws are forged of the best refined iron, and work in *solid cut thread* boxes.

The lower screw maintains the parallel position of the two jaws, by having exact motion with the upper working screw through the connecting chain which regulates it.

The chain is very accurately made of steeled links and rivets, and having no strain of the work upon it, is therefore as durable as all the other parts.

Prices with Special Discounts to the Trade.

No. 1,	Jaws	3½ in. x	⅞ in.	Screws	⅝ in.	diameter.	Lever	9 in.	long,	Opens	4¼ in. $8 00
" 2,	"	4½ in. x 1	in.	"	1⅛ in.	"	"	13 in.	"	"	5⅝ in. 13 00
" 3,	"	5¼ in. x 1⅜	in.	"	1⅜ in.	"	"	16 in.	"	"	6⅝ in. 17 00
" 4,	"	6¼ in. x 1⅝	in.	"	1⅝ in.	"	"	19 in.	"	"	7⅝ in. 22 00
" 5,	"	7 in. x 1⅞	in.	"	1⅞ in.	"	"	24 in.	"	"	9 in. 30 00
" 6,	"	8 in. x 1⅞	in.	"	1⅞ in.	"	"	26 in.	"	"	10 in. 34 00

All sizes of these Vises furnished with Swivel Attachment, at an additional cost of $1 to $3. Sold at the General Agencies.

THESE GOODS ARE SOLD BY THE GENERAL AGENTS (with special discounts to the trade).

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FISHER & NORRIS, Trenton, N. J.

OLIVER'S CHILLED PLOWS.

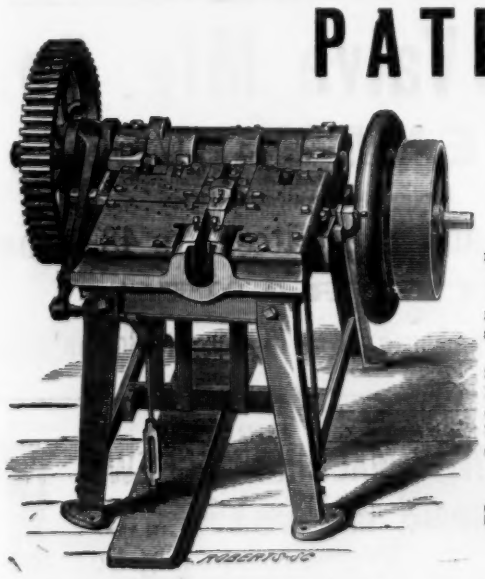
These implements, though but four years before the public in their present form, show the following remarkable record:

1506 were sold in the season of **1871.** **7472** were sold in the season of **1873.** **30,000** will be made for the season of **1875.**
3049 " " " **1872.** **14,976** " " " **1874.**

For full descriptive circulars, address,

SOUTH BEND IRON WORKS, South Bend, Ind.

PATENT BOLT HEADER



Manufactured by

WILLIAM GARDNER'S SONS,

575 Grand Street, N. Y.

Having investigated the comparative merits of this and all other machines, we can recommend it as the Best Bolt Header ever made.

It will commend itself for simplicity, durability, quality and quantity of work over all others.

It will make perfect Square or Hexagon Bolts, in from 3 to 5 revolutions, and runs at the rate of one hundred and twenty revolutions per minute. Plough, Track, Button-head Bolts, and all similar heads are made with one revolution.

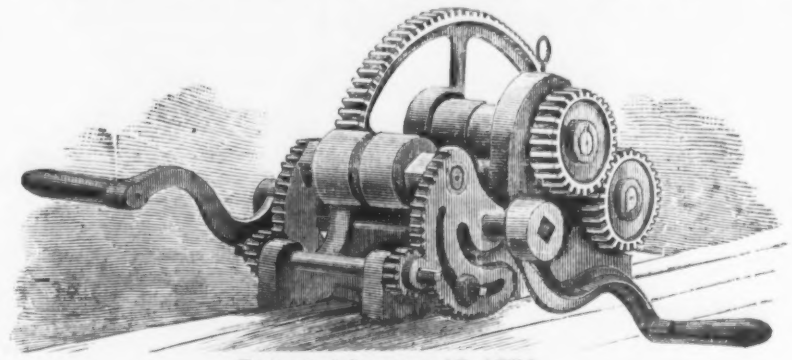
To show that it will stand the test of long continued strain, it has made eleven tons of half-inch Bolts from one-and-one-quarter to two-and-one-half inches long; eighteen tons five-eighth Bolts; twenty-six tons three-quarter Bolts, and thirty-seven tons seven-eighth Bolts, by one set of dies for each size, without change or repairs. It makes and cuts off the bolt from the heated bar, from one to ten inches, or of any greater length cut for the purpose, and either round or square Iron may be used.

ANY STYLE OF HEAD CAN BE MADE, INCLUDING

Square, Hexagon, T, Button, Countersunk, Cone, Plough and Track Bolts, &c., &c.

Guy C. Hotchkiss, Field & Co.,

85 First St., Brooklyn, E. D., and New York City.



Patented January 13, 1874.

This Machine is destined to supersede all Tire Benders now in use, especially for heavy work. The middle roller can be readily removed and readjusted, thus allowing Tires to be withdrawn without difficulty after being bent. Fifth Wheels and Tires never slip while being bent in this Machine. One man can bend a Tire 3x1 without difficulty.

Manufacture Carriage Materials, Axles, Springs, Blacksmiths' Supplies, Bolts, Wood Work, Trimmings, &c.

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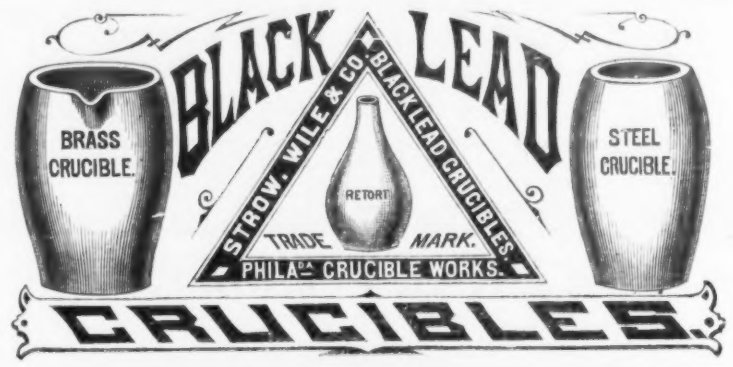

FOR MELTING ALL KINDS OF METALS.

And Manufacturers of

Sunny Side Stove Polish.

Lumber Pencils, Foundry Facings and Lubricating Plumbago.

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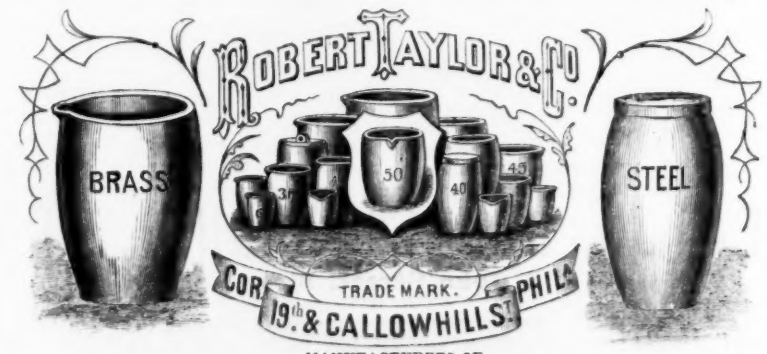

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Of all Sizes and Forms for melting

Steel, Brass, Gold, Nickel and all kinds of Metals.

Mr. Robert Taylor, who was for seven years the head of the late firm of Taylor, Strow & Co., and who is a practical mechanic, and familiar with all the details of the manufacture of Crucibles, attends personally to our manufacturing department. We would, therefore, respectfully solicit a continuance of the favors hitherto extended to him.

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CASTINGS of every description.

ROLLING MILL AND FURNACE EQUIPMENTS COMPLETE.

Rolls Turned for Rails, Beams, Angles, and all shapes for Iron, Steel, or Composition Metals.

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PASCAL IRON WORKS, Philadelphia,

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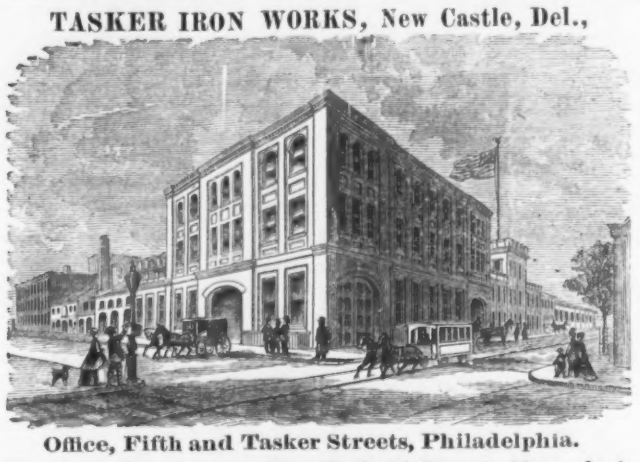

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IRON AND WOOD. 30 different styles. 90,000 ALREADY IN USE.

Smooth Planes,
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Cabinet Makers,
Car Builders,
Carriage Makers,
Millwrights,
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All Use them.

[No. 9½ Excelsior Block Plane, $2 00.]

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Factories: New Britain, Conn. Warerooms: **35 Chambers Street, New York.**

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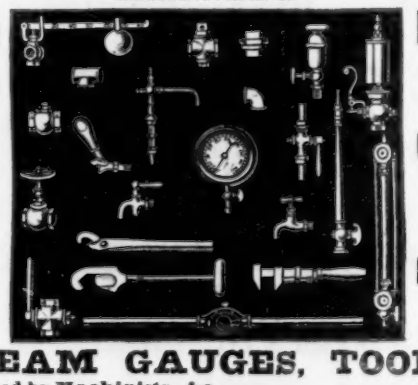
Wrought Iron **PIPE,** Cast Iron **FLANGED PIPE,** **Cast Iron** RADIATORS and BOILERS.



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STEAM GAUGES, TOOLS,

And all Supplies used by Machinists, &c.

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OAK BELTING,

Also, Picker or Moccasin Leather, for Boot and Shoe Packs.

Angular Belting and Pullies made to order.

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Ask for Star Stamped Lace Leather.

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This Strap, designated on our List as Letter "X," is of novel construction—is elastic, pleasantly yielding to the razor—gives a keen fine edge—is made of superior stock—is furnished at a low price—**and gives universal satisfaction.**

ITS PRICE SELLS IT.

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Best Quality Lap Welded Iron Boiler Tubes,

STEAM AND GAS PIPE,

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99 MAIDEN LANE, N. Y.

Sole Agent in the U. S. for

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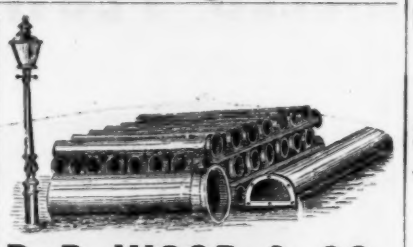

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FOR WATER AND GAS.

Lamp Posts, Valves, &c.,

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400 CHESTNUT STREET.

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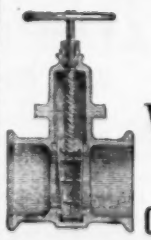
Iron and Composition, of all sizes.



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TURNED MACHINE SCREWS,

One-sixteenth to five-eighths diameter. Heads and points to sample.

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Lyon & Fellows Mfg. Co.,

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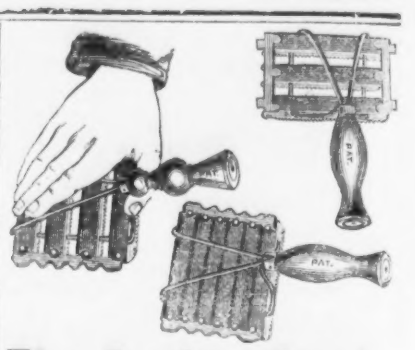

The Perfect Comb.

We call your attention specially to our new patent endless wire frame comb. The result of a long series of experiments, made with a view to meeting all the requirements of a *Perfect Comb*. It is better, stronger, and more durable than any ever before invented. The raised wire shank gives what has never before been attained, viz: a rest and brace for the thumb, in such a position that the hand cannot come in contact with the horse while using the comb. The wire braces which run from the shank over the back to the front teeth give strength and durability in a direction never heretofore attained, and at the same time serve as an extra handle; and when clasped by the fingers in connection with the raised shank the comb is more firmly, easily, and completely held, and with much less fatigue to the hand than is possible in any other formation—in short, it needs but a trial to vindicate its name: **The Perfect Comb.**

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PUMPS,

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Proprietors and Manufacturers of

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Pipe Wrench,

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MACHINE OILERS.

Dealers in

STEAM AND GAS FITTERS TOOLS.

DRILLS,

Pipe Tongs,
Pipe Cutters,
Pipe Threaders,
Flue Brushes.

M. D. CONVERSE & CO.,

68 Park Place, N. Y.

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Pope Bros., 45 High, Boston 34

Alarm Tills.
Tucker & Dorsey, Indianapolis, Ind. 37

Anvils. *Manufacturers of.*
Fisher & Norris, Trenton, N. J. 35

Augers, Bits, etc., *Manufacturers of.*
Shattuck W. F. & Co., 113 Chambers, N. Y. 8
Stearns G. N. & Co., Syracuse, N. Y. 17

Axes, Edge Tools, &c., *Manufacturers of.*
Francis Axe Co., Buffalo, N. Y. 31
Jones, M. H. Cohoes N. Y. 32

Axles, Springs, etc., *Manufacturers of.*
Brown D. Arthur & Co., Fisherville, Concord, N. H. ..33
Clark, Smith & Co., Fort Plain, N. Y. 12
Hotchkiss Guy C., Field & Co., Brooklyn, E. D. 25
Palmer J. & Co., Concord, N. H 12
Wentworth H. M. & Co., Gardiner, Me. 12

Band Saws and Tools for Brazing &c., *Importers of.*
Gueutal George & Son, 39 W. 4th, N. Y. 10

Base Knobs.
D. E. Peck Mfg. Co., Bristol, Ct. 6

Bed Screws, *Maker of.*
Shelton & Co., Birmingham, Conn 11

Bellows. *Manufacturers of.*
Churchyard, Joseph, Buffalo N. Y. 26
Newcomb Bro's., 586 Water, N. Y. 34
Scott Geo. M., Chicago, Ill. 19

Bells.
Weimer & Brokenbein, Lebanon, Pa. 16

Belting, Leather. *Makers of.*
Arny, C. W., 301 Cherry, Philadelphia. 12
Alexander Bros., 412 N. 3d., Phila. 12
Falee Geo. S., Pawtucket, R. I. 26

Bird Cages. *Makers of.*
Heinz, Pierce & Munschauer, Buffalo, N. Y. 7
Lindeman O. & Co., 254 Pearl, N. Y. 3
Maxheimer John, 249 Pearl, N. Y. 10
Osborn Mfg. Co., 79 Bleecker, N. Y. 7

Bit Braces. *Manufacturers of.*
Backus Q. S., 82 Chambers, N. Y 8
Miller's Falls Mfg. Co., 78 Beekman, N. Y. 25

Boilers, *Makers of.*
Tippett & Wood, Phillipsburg, N. J. 5

Bolt Heading Machines. *Manufacturers of.*
Chapin Machine Co., Pine Meadow, Conn. 33
Plumb, Burdict & Barnard, Buffalo N. Y. 40

Bolt Machinery.
American Bolt Co., Lowell, Mass 13
Forsaith S. C. & Co., Manchester, N. H. 38
William Gardner's Sons, 575 Grand, N. Y. 25

Brass. *Manufacturers of.*
Ansonia Brass and Copper Co. 19 Cliff, N. Y. 2
Brooklyn Brass & Copper Co., 100 John, N. Y. 2
Davol John & Sons, 100 John, N. Y. 2
Holmes, Booth & Hardens, 49 Chambers, N. Y. 2
Manhattan Brass Co., 83 Reade, N. Y. 2
Plume & Atwood Mfg. Co., 80 Chambers, N. Y. 2
Scovill Mfg. Co., 421 Broome, N. Y. 2
Waterbury Brass Co. 52 Beekman N. Y. 2

Brick Presses. *Makers of*
Carnell Geo., 1819 Germantown Ave., Phila. 27
Carnell F. L. & D. R., 1844 Germantown Ave., Phila. ..27

Bridge Builders.
Moseley Iron Bridge and Roof Co., 5 Dey, N. Y. 4

Brass Hardware, *Manufacturers of.*
Hopkins & Dickinson Mfg. Co., 69 Duane, N. Y. 18

Butcher and Shoe Knives. *Manufacturers of.*
Wilson John, Sheffield, England 33

Butts and Hinges. *Makers of.*
American Butt Co., Providence, R. I. 34
American Spiral Spring Butt Co., 82 Beekman, N. Y. ..40
Buffalo Hardware Co., Buffalo, N. Y 3
Crooke & Co., 168 Mulberry, N. Y. 38
McKinney Mfg. Co., Hamilton, O. 8
Shepard John D., Buffalo, N. Y. 18
Clark & Co., Buffalo, N. Y. 16
Roy & Co., West Troy, N. Y. 33
Union Mfg. Co., 99 Chambers, N. Y. 7

Carriage Bolts. *Makers of.*
Eagle Bolt Works, 2020 Arch, Philadelphia 13
Townsend, Wilson & Hubbard, Phila. 12

Carriage Hardware, *Makers of.*
Smith H. D. & Co., Plantsville, Ct. 12

Car Wheels, etc., *Manufacturers of.*
Jackson & Woodin Mfg. Co., Berwick, Pa. 2
Taylor Iron Works, High Bridge, N. J. 6

Chains. *Makers of.*
Wyatt Thos., 711 Eddy, Providence, R. I. 37

Chisels, *Manufacturers of.*
Barton D. R., Rochester, N. Y. 3
Buck Bros., Millbury, Mass. 11

Coal. *Miners of.*
Pardee A. & Co., 111 Broadway, N. Y. 10

Coal Vases.
Sidney Shepard & Co., Buffalo, N. Y. 31

Coal Hods. *Manufacturers of.*
Easterbrook Wm., 311 Cherry, Phila. 26
Smith, Burns & Co., 46 Cliff, N. Y. 34

Coffee and Spice Mills.
Lane Brothers, Millbrook, N. Y. 16
Enterprise Mfg. Co., Philadelphia, Pa. 34

Commission Merchants, *English.*
Goddard Samuel A. & Co., Birmingham, Eng. 2

Compasses and Dividers, *Manufacturers of.*
Bemis & Call Hardw. & Tool Co., Springfield, Mass. ..16

Cooper's Tools, etc., *Dealers in.*
Little Chas. E., 59 Fulton N. Y. 16

Crucibles, *Manufacturers of.*
Newkumet Adam, 1537 N. Front, Phila. 27
Strow, Wile & Co., 709 Market, Phila. 25
Taylor Robert & Co., 1900 to 1906 Callownill, Phila. ..25

Curry Combs. *Manufacturers of.*
Lawrence Curry Comb Co., 382 3d Avenue, N. Y. 36

Cutlery, *Importers of.*
Boker Hermann & Co., 101 Duane, N. Y. 33
Fisher Jos. S., 411 Commerce, Phila. 11
Friedmann & Lauterjung, 14 Warren, N. Y. 1
King, Briggs & Co., 80 Chambers, N. Y. 11
Peace Chas. Jr., 82 Chambers, N. Y 11
Ward Asline, 101 Duane, N. Y. 11
Wilson Hawksworth, Ellison & Co., 72 John, N. Y. ..36

Cutlery, *Manufacturers of.*
Burchhaw Aaron, Pepperell, Mass. 11
John Russell Cutlery Co., Turners Falls, Mass. 11
Meriden Cutlery Co., 49 Chambers, N. Y. 11
Miller Bros. Cutlery Co., W. Meriden, Conn. 11
Northampton Cutlery Co., 45 Murray, N. Y. 11
New York Knife Co., Walden, N. Y. 11
Woods Cutlery Co., Antrim, N. H. 11

Dog Collars, *Makers of.*
Mesereau W. T. & J., 62 Duane, N. Y. 9

Dog Muzzler. *Maker of.*
Mesereau W. T. & J., 62 Duane, N. Y. 11

Door Alarm. *Makers of.*
F. Blakemore, 3452 Market, Philadelphia 3

Door and Gate Springs.
Quackenbush, Townsend & Co., 59 Reade, N. Y. 19
Van Wagoner & Williams, 82 Beekman, N. Y. 40

Dredging, *and Makers of Dredging Machines.*
Am. Dredging Co., 10 S. Delaware ave., Phila. 33

Drill Chucks. *Manufacturers of.*
Roberts Dwight, 210 Wythe ave., Brooklyn, N. Y. ..17
Lambertville Iron Works, Lambertville, N. J. 29

Drilling Machines, *Makers of.*
Thorne & DeHaven, Philadelphia 28

Drop Forgings.
Billings & Spencer Co., Hartford, Ct. 10
Hammond B. & Co., Hartford, Conn. 3
Phila. Forging Works, 1302 to 1307 E. Thompson, Philadelphia 33

Edge Tools, *Makers of.*
Barton D. R., Rochester, N. Y. 3
Bradley G. W., 37 Chambers, N. Y. 16

Elevators. *Makers of.*
Otis Bros. & Co., 348 Broadway, N. Y. 9

Emery.
Abbott & Howard, New York and Boston 26
Gray Geo. H. & Danforth, Boston, Mass. 16
The Union Stone Co., 6 Exchange, Boston 32

Emery Cloth.
The Union Stone Co., 6 Exchange, Boston 32

Emery Wheels. *Makers of.*
Am. Twist Drill Co., Woonsocket, R. I. 32
Lehigh Valley Emery Wheel Co., Wessport, Pa. 32
The Union Stone Co., 6 Exchange, Boston 32

Endless Lever Hoists and Weight Movers.
Reamy Truck Co., Baltimore, Md. 34

Encaustic Tiles.
Findley Alex., 93 Malden Lane, N. Y 26

Engineers, Machinists, etc.
Henshall James, 1056 Beach, Phila. 34
Moore James, cor. 16th and Buttonwood, Phila. 35

Engines, Steam. *Makers of.*
Baird & Huston, Philadelphia, Pa. 33
Hartford Foundry and Machine Co., Hartford, Ct. 24
New York Steam Engine Co., 98 Chambers, N. Y. 39
Shapley & Wells, Binghamton, N. Y. 39
Utica Steam Engine Co., Utica, N. Y. 39
Woodruff Iron Works, Hartford, Conn. 38

Faucets, Brass. *Makers of.*
McNab & Harlin Mfg. Co., 56 John, N. Y. 26

Faucets, *Self-Measuring, Makers of.*
Enterprise Mfg. Co., of Pa., Phila. and N. Y. 34

Files, *Importers of.*
Carr J. & Riley 82 John, N. Y. 36
Fieger Joseph S., 411 Commerce, Phila. 11
Frasse Peter A. & Co., 26 Fulton, N. Y. 6
Moss F. W., 80 John, N. Y. 36
Sanderson Bros. & Co., 16 Cliff, N. Y. 36
Spear & Jackson, 116 Duane, N. Y. 33

Files, *Manufacturers of.*
Adamantine File Works, Providence, R. I. 13
American File Co., Pawtucket, R. I. 6
Auburn File Works, Auburn, N. Y. 6
Barnett G. & B., 41 and 43 Richmond, Phila. 6
McCaffrey & Bro., 1732 and 1734 N. 4th, Phila. 28
Nicholson File Co., Providence, R. I. 26
Wheeler, Clemson & Co., Middletown, N. Y. 10
Walsh, Coulter & Flagler, 83 Chambers, N. Y. 6
Western File Works, Beaver Falls, Pa. 8

Fire Brick. *Makers of.*
Brooklyn Retort and Fire Brick Works, Van Dyke, St., Brooklyn, N. Y. 27
Hall A. & Sons, Perth Amboy, N. J. 27
Hall A. & Sons, Buffalo, N. Y. 27
Harbison & Walker, Pittsburgh, Pa. 27
Horton & Mabie, Peekskill, N. Y. 27
Kreischer B. & Son, 58 Goerck, N. Y. 27
Miller S. P., 309 S. 5th, Philadelphia 27
Newkumet Philip, 23d and Vine, Phila. 27
Newton & Co., Albany, N. Y. 27
Watson John R., Perth Amboy, N. J. 27

Fishing Tackle.
Shipley A. B. & Son, 503 and 505 Commerce, Phila. 8

Flint and Emery Paper and Cloth.
Baeder, Adamson & Co., 730 Market, Phila. 11

Fluting Machines. *Makers of*
Felder Chas., 1 & 3 Chambers, N. Y. 14

Founders and Machinists.
Garrison A. & Co. Pittsburgh, Pa. 4

Galvanized Iron.
Lefferts Marshall Jr., 90 Beekman, N. Y. 4

Gas Fixtures. *Makers of.*
Bradley & Hubbard Mfg. Co., 21 & 23 Barclay, N. Y. ..40

Glass. *Importers of.*
Downing A. C. & Co., 57 Beekman, N. Y. 31

Governors.
Huntoon Governor Co., Lawrence, Mass. 33
Hartford Governor Co., Hartford, Ct. 38
Junius Judson & Son, Rochester, N. Y. 38
Shive Governer Co., Bethlehem, Pa. 38

Grindstones.
Wood Walter R., 283 and 285 Front, N. Y 32
Worthington & Sons, North Amherst, O. 33

Guns, &c
Schoverling & Daly, 84 Chamber St. 25
Tryon Edw. K., Jr., & Co., 19 N. Sixth, Philadelphia. 13
Windmuller Louis & Roelker, 20 Reade N. Y. 20

Gunpowder. *Makers of.*
Kneeland F. L. (Dupont) 70 Wall, N. Y. 36
Laflin & Rand Powder Co. 21 Park Row, N. Y. 38

Hammers, etc., *Manufacturers of.*
Emmet Hammer Co., Brooklyn, E. D., N. Y. 13
Hammond H., Hartford, Ct. 8

Handles. *Makers of*
N. Carolina Handle Co., 105 Reade, N. Y. 10

Hardware, *Brass and Galvanized.*
Tiebout W. & J., 290 Pearl, N. Y. 2

Hardware Commission Merchants.
Graham & Haines, 58 Chambers, N. Y. 34
Heaton & Denckla, Phila. and N. Y. 6
Maltby, Curtis & Co., 62 Reade, N. Y. 38
Peck G. Webster, 110 Chambers, N. Y. 2
Walbridge G. B. & Co. 99 Chambers, N. Y. 31
Walsh, Coulter & Flagler, 83 Chambers, N. Y. 6
Wilson J. Clark & Co., 81 Beekman, N. Y. 19

Hardware Dealers.
Brower John I. & Son, 288 Greenwich, N. Y. 18
Lloyd, Suppiee & Walton, 625 Market, Phila. 10
Quackenbush, Townsend & Co., 59 Reade, N. Y. 18
Shepard Sidney & Co., Buffalo N. Y. 31
Wilson J. Clark & Co., 81 Beekman, N. Y. 18

Hardware Importers.
Boker Hermann & Co., 101 Duane, N. Y. 33
Field Alfred & Co., 93 Chambers, N. Y. 33
King, Briggs & Co., 80 Chambers, N. Y. 10
Frith R., 16 Cliff, N. Y. 10
Van Wart & McCoy, 134 and 136 Duane, N. Y. 10
Turnor R. A., 37 Chambers, N. Y. 11
Windmuller Louis & Roelker 20 Reade N. Y. 20

Hardware Manufacturers.
Buffalo Hardware Co., Buffalo, N. Y. 3
Enterprise Mfg. Co., Phila. 34
Hart, Bliven & Mead Mfg. Co., 243 Pearl, N. Y. 34
Jacobus & Minick Mfg. Co., 96 Chambers, N. Y. 6
Lane, Gale & Co., Troy, N. Y. 16
Many & Marshall, 48 Warren, N. Y. 13
Middletown Tool Co., 18 & 20 Cliff, N. Y. 6
Miller's Falls Mfg. Co., 78 Beekman, N. Y. 25
Pratt & Co., Buffalo, N. Y. 31
Providence Tool Co., Providence, R. I. 13
Schweitzer Mfg. Co., 57 Reade, N. Y. 28
Shattuck W. F. & Co., 113 Chambers, N. Y. 8
Union Mfg. Co., 99 Chambers, N. Y. 7
Williams, White & Churchill, 73 Warren, N. Y. 25
Wilson Mfg. Co., 37 Chambers, N. Y. 12

Hardware Specialties.
Bracher T. W., 77 Greene, N. Y. 35
Byington & Northup, Rochelle, Ills. 2
Post C. C., Burlington, Vt. 17
Shepard Sidney & Co., Buffalo, N. Y. 31

Hoes. *Maker of.*
Rogers H. C., Jordan, N. Y. 10
Hicks O. B. & Co., Baltimore, Md. 16

Hoop Hangers, *Manufacturers of.*
Chambers & Quinlan, Decatur, Ill. 8
Hill H. W. & Co., Decatur Ills. 8

Hoisting Engines. *Makers of.*
Crane Bros. Mfg. Co., Chicago, Ill. 9
Otis Bros. & Co., 348 Broadway, N. Y. 9

Horse Hay Forks and Fixtures, *Makers of.*
Nellis A. J. & Co., Pittsburgh, Pa. 40

Horse Nails. *Makers of.*
Ausable Horse Nail Co., 35 Chambers, N. Y. 32
Brundage & Co., Middletown, N. Y. 10
Globe Nail Co., Boston, Mass. 32
Pratt & Co., Buffalo, N. Y. 32
Putnam S. S. & Co., Neponset, Mass. 10

Horse Shoes, *Makers of.*
Burden Iron Works, Troy, N. Y. 4
Schoenberger & Co., Pittsburgh, Pa. 4

House Furnishing Goods.
Bracher T. W., 77 Greene, N. Y. 35
Tuft & Howard, 15 Murray, N. Y. 31

Hydraulic Jacks.
Dudgeon Richard, 24 Columbia, N. Y. 33

Ice Tools.
Carter W. H., 100 Chambers, N. Y. 34

Insurance, Boiler.
Hartford Steam Boiler Inspection and Insurance Co..35

Iron Brokers.
Boynton Geo. A., 70 Wall, N. Y. 4
Crane U. O., 104 John, N. Y. 4
Hatry A. G., Pittsburgh, Pa. 4
Hazard & Jones, 204 Pearl, N. Y. 4
Read & Dickey, Cleveland, O. 40

Iron, Corrugated, *Manufacturers of.*
Moseley Iron Bridge and Roof Co., 5 Dey, N. Y. 4

Iron, Charcoal. *Warm or Cold Blast,*
Quincy John W., 98 William, N. Y. 4

Iron Commission Merchants.
Justice Cox Jr. & Co., 332 Walnut, Phila. 5
Cogklin Henry, 104 John, N. Y. 4
Hand Jas. C. & Co., 614 and 616 Market, Phila. 6
Hoopes W. Graham, 419 Walnut, Phila. 5
Malin Bros., 228 Dock, Phila. 5
Spooner & Collins, St. Louis, Mo. 5

Iron, Pig, *Importers of.*
Williamson James & Co., 69 Wall, N. Y. 4

Iron Dealers.
Abeel Brothers, 190 South, N. Y. 4
Bonnell, Botsford & Co., Youngstown, O. 5
Borden & Lovell, 70 and 71 West, N. Y. 4
Cleveland, Brown & Co., Cleveland, O. 4
Coddington T. B. & Co., 25 Cliff, N. Y. 4
Huerstel G., 99 Market Slip, N. Y. 4
Fuller, Lord & Co., 139 Greenwich, N. Y. 4
Fuller, Dana & Fitz, 110 North, Boston 2
Gardner Wm., 575 Grand, N. Y. 4
Harrison & Gillson, 536 to 562 Water, N. Y. 4
Holden, Hopkins & Stokes, 104 John, N. Y. 4
Jackson & Chase, 206 and 208 Franklin, N. Y. 4
Judson B. F., 457 and 459 Water, N. Y. 4
Matthews Chas. W., 133 Walnut Phila. 5
Mohr J. J., Philadelphia 5
Ogden Wallace, 342 Pearl, N. Y. 4
Packard, Goff & Co., Youngstown, O. 4
Pettee & Mann, 228 and 229 South, N. Y. 4
Pierson & Co., 24 Broadway, N. Y. 4
Quincy John W., 98 William, N. Y. 4
Reed John H. & Co. 6
Reinards D. W. & Co., 92 Mangin St., N. Y. 4
Richardson J. O., 329 Walnut, Philadelphia 4
Snyder Asa, Richmond, Va. 4
Strow Wm. Lawrence, 104 John, N. Y. 4
Wallace Wm. H. & Co., Albany and Washington streets, N. Y. 4
Warner A. B. & Sons, 28 and 29 West, N. Y. 4
Williamson James & Co., 69 Wall, N. Y. 4
Whitney A. R. & Co., 58 Hudson N. Y. 4

Iron, *Manufacturers of.*
Britannia Iron Works, Middlesbro', Eng. 6
Burden Iron Works, Troy, N. Y. 4
Cleveland Rolling Mill Co., Cleveland, O. 6
Coffin Wm. E. & Co., 8 Oliver, Boston 4
Boston Rolling Mills, 17 Batterymarch, Boston 4
Everson, Macrum & Co., Pittsburgh, Pa. 4
Girard Rolling Mill Co., Girard, O. 4
Lackawanna Iron and Coal Co., Scranton, Pa. 5
Leonard John, 45 to 451 West st., N. Y. 4
Milwaukee Iron Co., Milwaukee, Wis. 6
Naylor & Co., 6 Oliver, Boston 4
Old Dominion Iron & Nail Works Co., Richmond, Va. 6
Oxford Iron Co., 81 Washington, N. Y. 4
Phœnix Iron Co., 410 Walnut, Phila. 5
Rowland Wm. & Harvey, Phila. 40
Sterling Iron and Railway Co., 49 Pine, N. Y. 20
Shoenberger & Co., Pittsburgh, Pa. 4
Taylor, Mitchell & Pond, Massillon, O. 4

Iron, Swedish, *Importers of.*
Jessop Wm. & Sons, 91 and 93 John, N. Y. 38
Mitander Nils, 69 William, N. Y. 4

Keys and Cotters. *Manufacturers of.*
Barnes Geo. & Co., Syracuse, N. Y. 26

Knitting Machines, Upright Rotary, *Makers of.*
Clark Tompkins, Troy, N. Y. 31

Lace Leather. *Manufacturers of.*
Falee Geo. S., Pawtucket, R. I. 26

Lamps. *Manufacturers of.*
Patent Mechanical Lamp Co., 138 Chambers, N. Y. ..32

Lanterns. *Manufacturers of.*
Dietz R. E., (Tubular) 54 and 56 Fulton, N. Y. 40
Howard & Morse, 45 Fulton, N. Y. 2

Lawn Mowers, *Makers of*
Barlow & Walker, Sing Sing, N. Y. 9

Lead Pipe, &c., *Manufacturers of.*
Bayley, Farrell & Co., Pittsburgh, Pa. 2

Locks. *Manufacturers of.*
Bohannan Wilson, Broadway and Kossuth, Brooklyn, E. D. 13
Branford Lock Works, Branford, Conn. 34
D. K. Miller Lock Co., 712 Cherry, Philadelphia. 40
Romer & Co., Newark, N. J. 11
Trenton Lock Co., 48 Warren, N. Y. 13
Yale Lock Mfg. Co., 296 Broadway, N. Y. 9

Lubricators, (Patent) *Maker of.*
Crossley H. Brooklyn, N. Y. 33

Machinery, *Makers of.*
Chapin Machine Co., New Hartford, Ct. 39
Forsaith S. C. & Co., Manchester, N. H. 35
Pratt & Whitney Co., Hartford, Conn. 38
Sellers Wm. & Co., 1600 Hamilton, Phila. 39
Wetherill Robert & Co., Chester, Pa. 38
Whittier Machine Co., 1176 Front, Boston, Mass. 38
Wood Thomas, 2106 Wood, Phila. 39

Machine Screws, *Makers of.*
American Screw Co., Providence, R. I. 13
Lyon & Fellows Mfg. Co., Williamsburg, N. Y. 26
Reynolds & Co., New Haven, Conn. 4
Rochester Machine Screw Co., Rochester, N. Y. 13

Machinists' Tools. *Makers of.*
Blaisdell P. & Co., Worcester Mass. 39
Harrington Edwin & Son, 15th st. and Pa. ave., Phila. 22
New Haven Mfg. Co., New Haven, Ct. 39

Machinery and Tools, *Importers of.*
Graham Bros., 122 Cannon street, London, E. C. 36

Malleable Articles. *Maker of.*
Hammer & Co., Branford, Ct. 32

Manganese.
Hobbs, Pope & Co., 35 India st., Boston 24

Measuring Tapes.
Eddy Geo. & Co., 353 Classon Ave., Brooklyn, N. Y. ..30

Metal Dealers and Brokers.
Coddington T. B. & Co., 25 and 27 Cliff, N. Y. 4
Colt Edward W., 205½ Walnut, Phila. 4
Cort N. L. & Co., 220 & 222 Water, N. Y. 2
Crane C. O., 104 John, N. Y. 4
Crocker Bros., 32 Cliff, N. Y. 9
Gregg H. L. Co., 108 Walnut, Phila. 5
Lefferts J. C., 241 Pearl, N. Y. 4
W. J. Hammond, Pittsburgh, Pa. 2
Phelps, Dodge & Co., Cliff, bet. John & Fulton, N. Y. 2
Purves A. & Son, cor. South and Penn, Phila. 16
Quincy J. W., 98 William, N. Y. 2
Sturges Frank & Co., 72, 74 & 76 Lake, Chicago 3
Thomson A. A. & Co., 213 and 215 Water, N. Y. 2
Van Wart & McCoy, 134 and 136 Duane N. Y. 2

Metallurgists.
Britton J. Blodgett, 339 Walnut, Phila. 6
Drown Thomas M., Lafayette College, Easton, Pa. ... 6
Maynard & Van Rensselaer, 261½ Broadway, N. Y. ... 6
School of Mines, E. 49th, N. Y. 6

Mining Spikes
Roseberry Geo. D., Pottsville, Pa. 4

Miner's Candles, *Makers of.*
Joseph Boyd's Sons, 12 Franklin N. Y. 31

Molding Machines, *Makers of*
Corbin P. & F., New Britain, Ct. 34

Molders' Tools.
Carter H., 290 Pearl, N. Y. 10

Mop Heads. *Manufacturers of.*
Buffalo Hardware Co., Buffalo N. Y. 3

Mouse Traps, Catchemalive, *Makers of.*
Dietz R. E., 54 and 56 Fulton, N. Y. 40

Nails.
Schoenberger & Co., Pittsburgh, Pa. 4

Nickel Platers.
Hartman John, 1042 Ridge avenue, Philadelphia. ... 2
New York Nickel Plating Co. 133 West 25th, N. Y. .. 2

Norway Shapes, *Rollers of.*
Rowland Wm. & Harvey, Frankford, Phila. 40

Note Broker.
Gallaudet F. W., 3 and 5 Wall, N. Y. 4

Nuts, Bolts, etc., *Makers of.*
American Bolt Co., 210 Lawrence, Lowell, Mass. 13
Arms, Bell & Co., Youngstown, O. 12
Carpenter David, 402 Water N. Y. 4
Clark Bros. & Co., Millsdale, Conn. 12
Fuller, Lord & Co., 139 Greenwich, N. Y. 4
Haskell W. H. & Co., Pawtucket, R. I. 13
Hoopes & Townsend, 1230 Buttonwood, Phila. 13
Lewis, Oliver & Phillips, Pittsburgh, Pa. 13
New Haven Nut Co., Westville, Ct. 28
Old Colony Rivet Works, 116 Chambers, N. Y. 12
Roseberry Geo. D., Pottsville, Pa. 4
Russell, Birdsall & Ward, Port Chester, N. Y. 40
Plumb, Burdict & Barnard, Buffalo, N. Y. 40
Shelton Co., Birmingham, Conn. 11
Sternbergen J. H., Reading, Pa. 13
Union Nut Co., 78 Beekman N. Y. 33

Oil Stones, *Makers of.*
Boyd & Chase, 107th street and 1st avenue, N. Y. ..32

Oil Tanks,
Wetzel E. F. W., 75 Warren, N. Y. 28

Old Iron, etc.
Gregg H. L. & Co., 108 Walnut, Philadelphia. 5

Ore Crushers.
Blake Crusher Co., New Haven, Ct. 38

Packing for Engines, &c., *Manufacturers of.*
Glanding Jas. & Co., 115 Queen, Philadelphia 38

Paints.
Rocky Mountain Vermillion Paint Co., Prov., R. I. .32

Paints and Oils, *Dealers in.*
Devoe F. W. & Co., 117 Fulton, N. Y. 2

Patent Solicitors.
A. V. Briesen, 258 Broadway, N. Y. 20
Burke & Fraser, 37 Park Row, N. Y. 28
Cox & Cox, 229 Broadway, N. Y. 28
Bowson & Son, Phila. and Washington, D. C. 28
Munn & Co., *Scientific American*, 37 Park Row N. Y. .33
Stetson T. D., 23 Murray, N. Y. 25

Picture Nails, etc., *Manufacturers of.*
Richards T. C. & Co., 47 Murray, N. Y. 3

Pipes, Fittings, etc., *Makers of.*
Eaton, Cole & Burnham Co., 58 John, N. Y. 28
Meyer Henry C. & Co., 48 Cliff, N. Y. 40
McNab & Harlin Mfg. Co., 56 John, N. Y. 26
Nelson, Finkel & Co., 439 E. 10th st., N. Y. 26
Pancoast & Maule, 227 Pear, Phila. 26

Pipe Threaders, Cutters, &c.
Converse, M. D., 68 Park Place, N. Y. 26
Empire Mfg. Co., 18 William, N. Y. 39

Pipe, Water and Gas, *Makers of.*
McNeal John & Sons, Burlington, N. J. 6
Morris, Tasker & Co., 15 Gold, N. Y. 26
National Tube Works Co., 28 William, N. Y. 26
Warren Foundry & Mach. Co., Phillipsburg, N. J. ... 26
Wood R. D. & Co., 173 Broadway, N. Y. 26

Piston Packing.
Canfield John & Co., 1321 Fairmount Ave., Phila. ... 33

Plane Irons, *Manufacturer of*
Buck Bros., Millbury, Mass. 11
Middletown Tool Co., 18 & 20 Cliff, N. Y. 6

Planes, *Manufacturers of.*
Greenfield Tool Co., Greenfield, Mass. 34
Stanley Rule & Level Co., 35 Chambers, N. Y. 26

Plated Ware
Derby Silver Co., Derby, Ct. 40
Rogers & Bro. 208 Broadway 11

Plows, Chilled Iron, *Makers of.*
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Joseph Dixon Crucible Co., Jersey City, N. J. 40

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Empire Portable Forge Co., 50 John, N. Y. 9

Power Hammers, *Makers of.*
Forsaith S. C. & Co., Manchester, N. H. 35

Presses, Power, *Makers of.*
The Stiles & Parker Press Co., Middletown, Ct. 38

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Sturtevant B. F., 72 Sudbury, Boston 39

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Hall C. Henry & Co., 20 Cortlandt, N. Y. 16

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Rich William A., 107 Reade, N. Y. 7
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Cleveland Rolling Mill Co., Cleveland, O. 6
Griswold John A. & Co., Troy, N. Y. 36
Milwaukee Iron Co., Milwaukee, Wis. 6

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Metcalf, Paul & Co., Pittsburgh, Pa. 35

Razor Strops, *Makers of.*
B. F. Badger, Charlestown, Mass. 36

Revolvers.
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Old Colony Rivet Works, 116 Chambers, N. Y. 12
Timmes Peter, 291 North 6th, Brooklyn, E. D. 4

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Revolving Scraper Co., Columbus, O. 16

Rolling Mill Machinery, etc., *Manufacturers of.*
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Moore James, Cor 16th and Buttonwood, Phila. 35

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Penna. Warehousing & Safe Deposit Co., Front and Lombard, Philadelphia 28

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James Ohlen, Columbus, O. 10
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American Screw Co., Providence, R. I. 13
Miles F. S.,

Carillons.

The London *Times*, of March 31, has the following: Those of our readers who have visited Antwerp doubtless brought away with them pleasant memories of the sweet chimes which ring out at very frequent intervals from the grand old cathedral tower. Those, too, to whom Bruges is familiar will also remember the carillon in the belfry of the market place, the memory of which has been embalmed by Longfellow in two of his miscellaneous poems, in one of which he tells us how that—

In the market place of Bruges stands the belfry old and brown,
Thrice consumed and thrice rebuilded, still it watches o'er the town.

So, too, in other Continental cities have bells been made to prove a source of frequent pleasure by mechanical means, apart from the mere striking of the hours and chiming of the quarters. Nor has this matter been unattended to in our own country, and in this metropolis—as witness the carillon of St. Clement Danes, in the Strand, to which belated passers-by must often have listened with satisfaction. But there is a fault here, as indeed in many other cases of tune-playing church clocks, in the machinery adopted for the purpose, which is simply inefficient. The defective performance is due to the circumstance that hitherto in all carillon machinery the tune barrel has had to perform the heavy work of lifting the bell hammers. Now, seeing that the hammers vary very considerably in size and weight, it results that when a heavy hammer has to be raised a much longer time is required than when a light one has to be lifted. Hence the jerky, irregular character of the music produced, which will be executed rapidly with high and slowly with low notes. It remained for Messrs. Gillett & Bland, of the steam clock factory, Croydon, to work out a marked and precise improvement in this respect, and to introduce a system of carillon machinery which would interpret a tune or piece of music correctly. To effect this it was necessary to remodel the system entirely, the main point being to relieve the tune-barrel of the labor of lifting the bell hammers, which duty is now imposed upon a secondary piece of mechanism. The primary duty assigned to the barrel is that of releasing a series of keys or detents, with which the studs in the barrel are made to engage as the barrel revolves. These keys act upon a series of levers which are brought into contact with a cam-roller, and it is the cams and the levers together that effect the lifting of the hammers. This relieves the tune-barrel of all strain, and the power of the cam arrangement insures regularity and precision at every stroke, whether on a large or a small bell. The motive power is obtained by weights, and the time is regulated by vanes, which are capable of easy adjustment. Messrs. Gillett & Bland's carrillon apparatus has been adopted at Worcester Cathedral, St. Stephen's Church, Hampstead, the Town Halls of Rochdale and Bradford and at other places. The most recent example, however, is that at the parish church of St. Leonard's, Shoreditch, which was opened at noon on Tuesday, and brought some excellent music out of the splendid peal of the bells—one of the finest in London—which that church possesses. The machine is fixed in the chamber below the bells, and embodies all the most recent improvements by the manufacturers. The apparatus plays fourteen tunes from two barrels which have to be exchanged as each is played out. The arrangement of the tunes is as follows: No. 1 barrel, Sunday, "Easter Hymn;" Monday, "Rose of Allendale;" Tuesday, "My Lodging is on the Cold Ground;" Wednesday, "The Sicilian Mariner's Hymn;" Thursday, "Lass o' Gowrie;" Friday, "Swiss Boy;" Saturday, "The Mermaid." No 2 barrel, Sunday, "Rock of Ages;" Monday, "Annie Laurie;" Tuesday, "Ring the Bell, Watchman;" Wednesday, "Last Rose of Summer;" Thursday, "Blue Bells of Scotland;" Friday, "There's Nae Luck About the House;" Saturday, "Home, Sweet Home." These tunes are played on 12 bells, the tenor weighing about 34 cwt., and the peal ranging from CC to G. The carillon machine has 24 levers, two to each bell, in order to enable several notes in quick succession to be played upon the same bell when necessary. A tune will be played three times over, every three hours day and night, the change of tune being effected at midnight by a self acting shifting apparatus. By changing the barrels weekly, a fresh tune will be played every day for 14 days; but any number of tunes can be played by having other barrels with seven tunes pricked on each. The barrels are not costly, and can easily be changed. By attaching a keyboard, such as is used in a pianoforte, to the apparatus, anyone can play with ease upon the bells with the fingers. The machine can also be made to chime changes similarly to ringing a peal, and also to ring the bells for the church services. At present, however, operations at St. Leonard's are confined to playing the tunes we have mentioned. The motive power of the carillon machine is obtained by a weight of 900-weight, which has a vertical range of 72 feet to descend through, the apparatus being wound up once every twenty-four hours. The carillon machine is started every three hours by the church clock, which, however, is an old one, and has been repaired, or rather patched up, by Messrs Gillett & Bland, sufficiently to enable it to work well for some time. Eventually, however, it will have to be replaced with a new clock. At the opening on Tuesday each of the tunes was played in succession with excellent effect, and to the satisfaction of all interested, especially the crowd of parishowners and others who had assembled within the precincts of the church to listen to the performance. Most of the tunes, especially the sacred ones, were given with precision, and if we notice the fact that in one or two cases a slight discrepancy was observable in the time, it is only to add that such may to some slight extent be expected where a comparatively heavy piece of mechanism is made the exponent of a delicately balanced melody. Messrs. Gillett & Bland, however, are to be complimented upon the great advance they have made in the direction of bell playing, and the high degree of perfection to which they have brought their carillon machines. We may add that this firm are about to add two more bells to the peal at Worcester Cathedral, and to prick twenty-one fresh tunes. When this has been done there will be fifteen bells and a carillon machine playing twenty-eight tunes. The firm are also fitting up a carillon machine at the Wool Exchange, Coleman street. It will play fourteen tunes on eleven bells, and will be the first carillon machine erected within the city of London.

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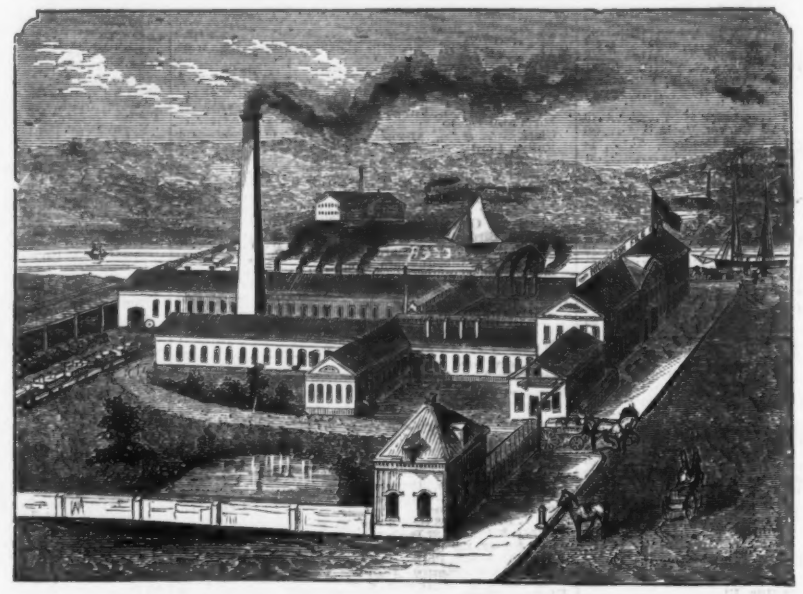

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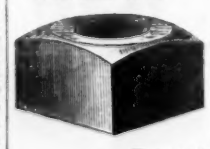

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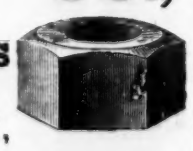

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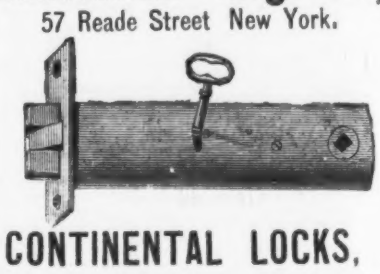

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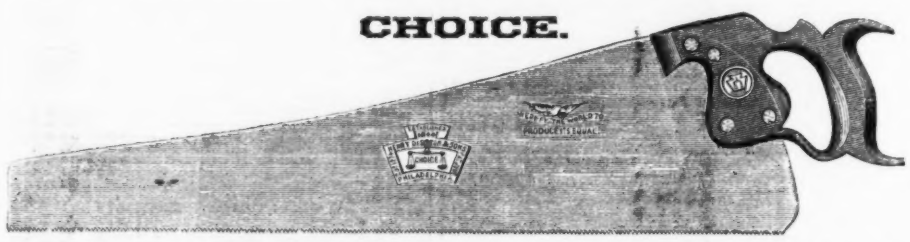

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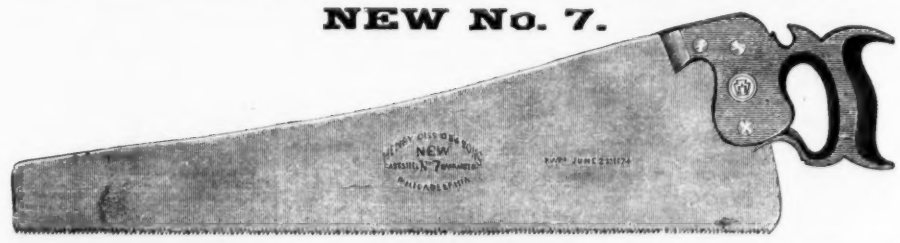

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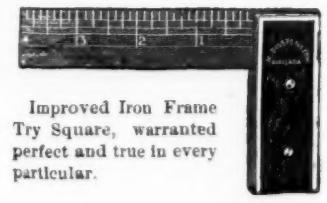

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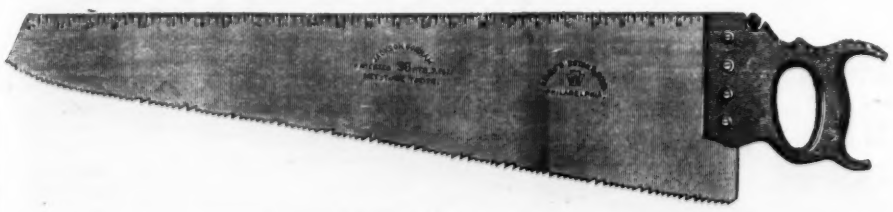

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Coal, Garden and Stone (Pugsley & Chapman).....dis 25
Well Wheels.
Revised list.....dis 60&10 %
Wire.
Brass and Copper.....dis 10 %
Bright and Annealed.....Nos. 0 @ 18 dis 40 @ 45 %
" " " 19 @ 26 dis 47½ @ 52½ %
" " " 27 @ 36 dis 52½ @ 57½ %
Coppered.....0 @ 18 dis 35 @ 40 %
Galvanized, Nos. 2 to 9.....₩ lb 8½ @ 9c net
Galvanized, Nos. 10 to 18.....market list dis 10 @ 15 %
Tinned.....dis 25 @ 30 %
Cast Steel.....dis 15 @ 20 %
Tinned Broom Wire.....dis 30 @ 35 %
Galvanized Telegraph, Nos. 8 and 9.....₩ lb 9c @ 9½c
Galvanized Telegraph, Nos. 10 and 11.....₩ lb 10c @ 10½c
" " " 12.....₩ lb 10½c @ 11c
Annealed Fence, Nos. 8 and 9.....dis 40 @ 45 %
" Grape, " 10 to 14.....dis 40 @ 45 %
Fence Staples.....₩ lb 8 @ 8½ %
Stubs' Steel Wire.....$7 00 to £ gold
Judd's Picture Wire.....dis 50 %
Wrenches.
American Adjustable.....dis 45 %
Baxter's Adjustable "S".....dis 30 %
" Diagonal.....dis 30 %
Collins & Co.'s.....dis 40 %
Coes' Genuine.....dis 40&5 %
" Pattern (Wrought).....dis 50&10 %
" " (Malleable).....dis 60&10 %
Lindsay's Patent.....dis 25 %
Taft's Pattern.....dis 70&10 %
Davis' Patent Duplex.....new list dis 25 %
Bemis & Call's Patent Combination.....dis 20&5 %
" " Merrick's Pattern.....dis 25&2½ %
" " Brigg's Patent.....dis 15&10 %
Aiken's Pocket.....per doz $10 00—dis 45&10 %

Wringers.	Less than 2 doz	2 doz lots
Providence	₩ doz $64 00	$52 00
Reliance	₩ doz 61 00	50 00
Universal—Extra	₩ doz 64 00	62 00
Novelty	₩ doz 64 00	62 00
Sherman	₩ doz 64 00	62 00
Eureka (Friction)	₩ doz 60 00	58 00

TIN WARE AND TRIMMINGS.

STAMPED TIN WARE, dis 5 %.
COMMON STAMPED WARE, &C.
Bucket Covers.

Quarts	½	1	2	3	4
Inch	4½	5 3-16	6 5-16	6¾	7 11-16
Per gross	$2 00	2 60	3 40	4 25	5 75
Quarts	6	8	10	12	
Inch	8¾	9¾	9¾	10 9-16	
Per gross	$6 50	8 00	8 50	11 50	

Cake Box Covers.

	Small.	Medium.	Large.
Inch	11½	12½	13½
Per gross	$15 00	18 00	22 00

Pie Covers.

Inch	7¾	8¼	8¾	9¼	9¾	10¼
Per gross	$5 75	6 00	6 25	6 75	7 25	8 25
Inch	10¾	11¼	11¾	12¼	12¾	13¼
Per gross	$8 75	9 50	10 00	13 00	13 75	16 50

Pie, Dinner or Scolloped Plates.

Inch	6	7	8	9	10	11
Per gross	$4 00	4 50	5 50	5 50	8 50	10 50

Deep Pie Plates.

Inch	9	10
Per gross	$8 50	10 50

Jelly Cake Pans.

Inch	9	10
Per gross	$7 50	10 00

Coffee Pot Covers.

Plain	1½	2	3	4	5	6 qts.
Inch	3	3½	3¾	4½	5	
Per gross	$1 15	1 40	1 60	2 00	2 75	3 00
Rimmed	2¾	3	3½	4	4½ inches.	
Per gross	$2 25	2 50	3 00	3 50	4 00	

T. K. Breasts only.

Inch	7¾	8	8½	9	9½	10	10½	11	11½
Per gro.	$6 00	6 50	6 75	7 25	7 75	9 50	10 00	12 00	13 00

Grater Plates.

Sheet	¼	½	1
Per gross	$3 00	6 00	11 50

Scolloped Cake Pans.

	Small.	Large.
Without Tubes	per gross, $8 00	11 50
With Tubes	" 10 50	14 00

Stamped Square Pans.

No	¼	½
Per gross	$7 50	14 50

Common Square Pans (One Sheet).

Per gross	$11 50

Milk Skimmers (Plain or Pierced).

Per gross	$4 00

Lettered Plates.

Inch	5½	6
Per gross	$3 75	4 00

Steamer Bottoms.
Add $1 per gross, or 10c. per doz. to list of Pot Covers.
Tin Stove Pipe Rings.

Inch	4	4½	5	5½	6	7
Plain	per gro. $4 00	4 50	5 00	5 50	6 00	7 00
Jap'd or Burn'd	" 6 00	6 50	7 00	8 00	9 50	10 00

Coffee Boiler Lips.

	Small.	Large.
To Rivet	per gross, $0 80	1 10
To Solder	" 1 25	

DEEP STAMPED AND RETINNED WARE, dis 25 %
Plain Stamped Water Dippers.

	½ pint.	Pint.	Quart.	quarts.	2½ quarts.
Per doz	90	1 15	1 50	1 85	2 50

Retinned Milk Pans.

Qts	½	1	1½	2	3	4	5	6	8	10	12
₩ doz	1 20	1 50	1 75	2 00	2 25	3 15	3 50	3 85	4 75	5 25	5 75

Dipper Bowls, Plain Stamped—

Pints	½	1	Quarts	1	2	2½
Per doz.	70	75	Per doz	1 00	1 25	1 75

Dipper Bowls, Retinned—

Pints	½	¾	1	Quarts	1	2	2½
Per doz.	75	95	1 05	Per doz	1 40	1 75	2 25

Pans.
Dish Pans, Retinned Deep—

Quarts	7	9	10	14	17	21	30
Per doz.	8 50	9 50	11 00	13 00	16 00	19 00	30 00

JAPANNED TIN WARE, dis 5 %.

Canisters, Common	Pound	½	1	2	3
	Per gross	$10 50	15 00	24 00	30 00
Canisters, Hinged	Pound	1	1½	2	3	4
	Per gross	$19 00	25 00	32 00	37 00	42 00
Canisters, Square	Pound	2	4	6	8	12	16
	Per doz	$3 00	4 25	5 00	5 75	8 00	9 00

Candlesticks, Japanned.....No. 1 2
Per gross $8 00 14 00
Cake Boxes, Round.....per nest, $3 25
Square.....per nest, 4 25
Chamber Pails, Japanned

Nos	2	3	4	5
Green, per doz	$8 00	9 00	11 00	13 00
Oak "	9 00	11 00	12 00	13 50

Dust Pans, Corrugated.....per gross, $22 00
Box Graters.....per gross, $3 75
Molasses Cups.....Pint ½ 1 2 4
Per gross $13 00 16 00 28 00 42 00
Lunch Boxes, per doz.....7 in. $2 00; 8 in. $2 50
Pepper Boxes Japanned..₩ gross small, $3 00; large, $4 00
Toy Banks, House.....No. 1 2
Per gross $7 00 5 50
Toy Banks, Gothic.....No. 1, $6 00, No. 2, 4 00 per gross
Toy Cups, Straight.....No. 1 2 3
Per gross $3 75 3 25 2 75
Toy Cups, Flaring.....No. 1, $4 25; 2, $3 75 ₩ gross
Toy Pails, Covered.....No. 1, per gross $4 00
Toy Rattles.....per gross, $2 00
Trunks, Wire Handled.....per nest (5) $1 75
Spittoons, Tin.....per gross, $27

PLANISHED TIN WARE, dis 25 @ 30 %.
Planished Coffee Pots, Round.

Each	60	75	85	95	1 15	1 25	1 30	1 40
Pints	1	2	3	4	5	6	7	8

Planished Tea Pots, Round.

Each	70	80	95	1 05	1 25
Pints	2	3	4	5	6

Planished Tea Pots, Oval.

Each	70	80	90	1 05	1 15	1 40	1 75
Pints	1	2	3	4	5	6	8

Planished Pepper Boxes, No. 1.....per doz., $1 50
Planished Flour Dredges, No. 3, $2 10; 4, 2 45 ₩ dozen.
Planished Round Coffee Biggins.

Pints	2	3	4	5	6	8
Each	1 00	1 10	1 20	1 40	1 60	2 00

Planished Oval Coffee Biggins.

Pints	2	3	4	5	6	8
Each	1 15	1 25	1 40	1 60	1 80	2 25

Planished Oval Chafing Dishes, Imperial Covers.

Inch	10	12	14	16	18	20	22	24
Each	3 65	5 00	6 25	7 60	9 00	11 50	15 00	16 50

Planished Oval Chafing Dishes, Low Covers.

Inch	10	12	14	16	18	20
Each	3 25	4 35	5 20	6 20	7 90	9 25

Planished Low Dish Covers.

Inch	10	11	12	14	16	18	20
Each	70	80	1 00	1 25	1 50	2 00	2 75

Planished Imperial Dish Covers.

Inch	10	11	12	14	16	18	20	22	24
Each	1 55	1 70	2 00	2 60	3 15	3 45	4 00	5 45	6 30

Planished Etnas, on Stands.

Pints	1½			3	4	5
Each	80 00	1 00	1 20	1 40	1 75	

Planished Liquor Mixers.....Nos. 0 1 2
Per doz $2 00 2 10 2 45
Planished Oval Melon Molds.

Nos	2	3	4	5	6	7	8	9
Each	60	65	70	80	90	1 00	1 15	1 35

Planished Oval Tumbler Warmers.
To fit 1, 2, 3, and 4 O. G. Urns.....each, $2 50
Planished Oval O. G. Urns.

Nos	0	1	2	3	4	5	6	7	8
Each	4 90	5 45	6 30	7 00	7 75	9 25	11 25	12 80	15 60

Planished Round Urns.

Nos	0	1	2	3	4	5	6	7
Each	4 20	4 85	5 45	6 30	7 75	9 00	11 00	14 25

Planished Round Oyster Dishes, (Complete).Nos. 1 2
Each $2 10 2 80
Planished Oyster Dish Plates.....Nos. 1 2
Each $0 25 0 30
Oyster Dish Covers.....Nos. 1 2
Each $0 30 0 35

Tea Pot Handles—P. S. & W.....dis 20 %
Stow's Patent Hollow Tea Pot Handles.
No. 1, Small 4½ inches.....per gross, $11 50
No. 2, Medium, 5¾ " " 12 50
No. 3, Large, 6½ " " 13 50
No. 4, Ex. Large 7¼ in., for Wash Pitchers &c....." 18 00
Solid Iron. Tin Tipped.
No. 10, Small, 4¾ inches.....per gross, $9 00
No. 15, Medium, 5½ " " 9 50
No. 20, Large, 6½ " " 10 75
Stow's Patent Hollow Tea Pot Handles, Adamantine Bronze—P. S. & W.
No. 12, Bronzed and Tin-Tipped.....per gross, $13 50
Saucepan Handles, Or Best Malleable Iron.
P. S. & W.....dis 20 %
Japanned.
No. 1, 5½ inches long.....per gross, $3 50
No. 2, 6 " " 3 75
No. 3, 6½ " " 4 00
No. 4, 7¼ " " 4 25
No. 5, 8 " " 4 50
No. 6, 9 " " 4 75
Tinned.
No. 1, 5½ inches long.....per gross, $4 25
No. 2, 6 " " 4 50
No. 3, 6½ " " 4 75
No. 4, 7¼ " " 5 25
No. 5, 8 " " 5 50
No. 6, 9 " " 5 75
Japanned.....per lb., 16
Tinned.....20
Iron Kettle Ears (P., S. & W.).....dis 45 %
Half gross pairs in a package.
Tinned.

Nos	1	2	3	4	5	6	7
Per gross pairs	88c	$1 00	1 50	1 75	2 10	2 75	3 75

Black.

Nos	1	2	3	4	5	6	7	8
Per gross pairs	75c	88c	$1 35	1 50	1 75	2 25	2 75	4 00

Tinned Tea Kettle Ears.

Nos	4	5	6
Per gross pairs	$1 75	2 10	2 75

Extra Heavy Tinned Kettle Ears—French Pattern.

Nos	2	3	4	5	6	7
Per gross pairs	$1 00	1 25	1 50	1 75	2 00	2 50	3 00

Malleable Iron Kettle Ears for Coal Hods
F., S. & W.....dis 20 %
No. 10 Small.....₩ lb. Tinned 2c; black, 16c
No. 20 Medium.....₩ lb, " 2½c; " 16c
No. 30 Large.....₩ lb, " 3c; " 16c
No. 40 Extra Large.....₩ lb, " 20c; " 16c
In cases of 100 lbs. each.
Milk Can or Boiler Handles—(P. S. & W.) 4½ in..dis 25 %
Plain, 8c.; Japn'd, 9c.; Tinned, 15c. per lb.; Malleable Clips or Ears to match, Tinned.....30c per lb.
Toilet Ware Handles—4½ inches (P. S. & W.).....dis 35 %
Plain with drilled holes, per lb.....9c
Plain with Cast " " 8c
Plumbers' Scrapers—(P. S. & W.).....dis 25 %
Extra quality, length 6 in., per doz.....$4 00

METALS.

IRON.—DUTY Bars, 1 to 1½ cents per lb., Sheet, Band, Hoop and Scroll, 1¼ to 1½ cents per lb. Provided, that none of the above Iron shall pay a less rate of duty than 35 per cent. Pig, $7 per ton; Polished Sheets, 3 cents per lb.; Wrought Scrap, $8 per ton; Cast Scrap, $6 per ton. Railroad, 75 cents per 100 lbs. Boiler and Plate, 1¼ cents per lb.

Pig Iron—AMERICAN.

Foundry No. 1	₩ ton,	$28 00 @
Foundry No. 2	"	26 00 @
Gray Forge	"	24 00 @ 26 00
White and Mottled	"	
SCOTCH.		
Coatness	"	36 00 @
Glengarnock	"	36 50 @
Eglinton	"	33 00 @

Bar Iron.
Am. Refined, at mill.....nominal

Rails.
Welsh, gold.....₩ ton,
American, at works, currency.....48 00 @ 53 00
Old Rails.....29 00 @ 30 00

Scrap.
Wrought Scrap.....35 00 @ 37 00

Bar Iron from Store.
Common Iron.
¾ to 2 in. round and square.....
1 to 6 in. x ⅜ to 1 in.....₩ ton $60 00 @ 62 50
Refined Iron.
¾ to 2 in. round and square.....
1 to 6 in. x ⅜ to 1 in.....65 00 @ 67 50
1 to 6 in. x ¼ and 3-16.....70 00 @ 72 50
Shafting Iron—2½ to 4 in.....72 50 @ 92 50
Rods—3-16 to ⅝ round and square.....67 50 @ 120 00
Bands.....80 00 @ 82 50
Hoops—⅝ to 2 in.....87 50 @ 140 00
Swedish Iron.
Ordinary sizes.....132 50 @ 135 00
Plow size.....145 00 @ 150 00

Sheet Iron.

	Common American and English.	R. G. American.	R. G. English.
Nos. 10 to 20	₩ lb 4¼	5¼c	5½c
21 to 24	" 4½ @ 4¾c	5¾c	5¾c
25 to 26	" 4¾c	5¾c	5¾c
27	" 5c	5¾c	6c
28	" 5¼c	5¾c	6¼c

Galvanized, 14 to 24, prime, ₩ lb 9; 24 quality...₩ lb 8c

"	21 to 24	" " 10	" 9c
"	25 to 26	" " 11	" 10c
"	27	" " 12	" 11c
"	28	" " 13	" 12c

Patent Polished.....₩ lb 14c
Russia, Nos. 8 to 26.....17c
" Stained, No. 1.....16c
Belgian.....10c
One piece Corrugated Sheet Iron Elbows.

CHARCOAL IRON

¼	⅜	½	⅝	¾ inch.
$2 50	3 50	4 50	5 25	6 50 per doz.

RUSSIA IRON.

4½	5	5½	6	7 inch.
$5 00	7 00	9 50	12 00	14 00 per doz.

COPPER—DUTY Pig, Bar and ingot, 5c.; old copper, 4 cents ₩ lb.; Manufactured (including all articles of which copper is a component of chief value) 45 % ad valorem.
American ingot.....₩ lb 22 @ 22½c
English " "

SHEATHING, BRAZIERS COPPER, BOLTS, &C.

Braziers Copper, ordinary sizes, over 16 oz., per square foot	33c ₩ lb
Braziers' Copper, ordinary sizes, 16 oz. and over 12 oz., per square foot	35c. "
Braziers Copper, 12 oz. per square foot and lighter	39c. "
Circles less than 24 inch in diameter	35c ₩ lb
Circles, 24 inch diameter and over	39c. "
Segment and Pattern Sheets	35c. "
Locomotive Fire Box Sheets	32c. "
Sheathing Copper, over 12 oz. per sq. ft.	31c. "
" 12 oz. ₩ sq. ft. and lighter	39c. "
Bolt Copper	35c. "
Copper Bottoms, 32 c. ₩ lb	net

No Copper in Sheathing except 14x48 inches, and not to exceed 34 oz. to the square foot.

O'NEILL'S PATENT PLANISHED COPPER.

14x48.
14 and 16 oz. and heavier.....32c. By the case, c. ₩ lb
12 oz. and lighter.....39c. " " 38c "

Boiler Sizes.
7 in., 14x52. 8 in., 14x56. 9 in., 14x60
14 and 16 oz. and heavier.....38c. By the case, 37c. ₩ lb
(And all sizes not over 30 inches wide.)
30x60
14 and 16 oz. and heavier.....40c. ₩ lb
12 oz.....43c. "

TINNING.

x48, by the case	8c. ₩ sheet
x48, less than case	10c. "
Boiler sizes, 7 and 8 inch	12c. "
" 9 inch	15c. "
Other sizes not larger than 30x60	2½c. ₩ sq.
Larger than 30x60	3c. "

LEAD—DUTY Pig $2 per 100 lbs.; old Lead, 1½ cent per lb.; Pipe and Sheet, 2½ cents per lb.

Spanish	6¾ @ 7c gold
German Refined	6¾ @ 6¾c gold
English	6¾c. gold
American	6¾ @ 6¾c gold
Bar	dis 10 % .....5½c.
Pipe	dis 10 % .....8c.
Tin Lined Pipe	dis 10 % .....10½c.
Sheet	dis 10 % .....9½c.
Shot	dis 10 % Drop, 10c. Buck, 11c.

BABBITT METAL.

S. P. U.	₩ lb 8½ @ 9c
A. 25c.; B. 22c.; C. 18c.; D 13c., ₩ lb.	

SOLDER.....No. 1, 15c; No. 2, 13½ @ 14c

STEEL—DUTY: Bars, Ingots, Sheets and Coils, valued at 7 cents per lb., or under, 2¼ cents; over 7 cents, and not above 11, 3 cents per lb.; over 11, 3½ cents per lb. and 10 % ad val. Railway Bars 1¼ cents per lb. Railway Bars, in part Steel, 1 cent per lb. Provided, that Metal cemented, cast or made from Iron by the Bessemer or pneumatic process, of whatever form or description, shall be classed as

American Cast Steel.

Tool	15 @ 16c
Spring	10c
Homogeneous	12½c
Tire	12½ @ 13½c
Machinery (round and square)	10 @ 11c
File	11c
Sheet	14 @ 16c
Saw Plate, mill and mulay	14 @ 16½c
Saw Plate, gang and X cut	13 @ 14c
" Circular as to size	18 @ 30c

Chrome Steel.

Tool	₩ lb 30 @ 31c
Tool, extra fine	" 40 @ 75c
Spring	₩ lb 12c and upward
Machinery	₩ lb 14c
Hammer	" 15c.
Gun or Homogeneous	" 16c

English Steel, payable in gold, net.

Best Cast	₩ lb 17½c
" Extra Cast	" 14½c
" Round Machinery, Cast	₩ lb 10½ @ 11½c
" Swaged, Cast	" 19½c
" Best Double Shear	" 17½c
" Blister, 1st quality	" 14½c
" " 2d quality	" 13 c
German Steel, Best	" 11½c
do 2d quality	" 10½c
" 3d quality	" 9½c
Sheet Cast Steel, 1st quality	" 14½c
" " 2d quality	" 14½c
" " 3d quality	" 12½c
File Steel, Flat and ⅝ Round	" 12½c
" Square and Round	" 12½c
" Mill	" 13½c
" Taper to 4 inch	" 16c
" Taper 3 and 3¼ inch	" 18c

SPELTER—DUTY: In Pigs, Bars and Plates, $1 50 per 100 lbs.

Silesian, cash	6¼ @ 7c, gold
American "	7 @ 11c., currency

TIN—DUTY: Plates, Sheets, Dagger and Terne, 1½c per lb.; Electro-galvanized Plates, 2 cents per lb.; Manufactures of, not enumerated, 35 per cent. ad val. Bars, Block and Pigs, free. Banca, subject to duty of 10 per cent.

Banca	₩ lb 25c., gold
Straits	₩ lb 21c., gold
English	₩ lb 20½c., gold

CHARCOAL TIN PLATE.

I C 10x14, Prime Charcoal	11 50
12x12 "	12 00
14x20 "	17 25
I X 10x14 "	13 75
12x12 "	14 25
14x20 "	17 75
D C 12½x17 "	11 00
D X 12½x17 "	13 25
For each additional X add	2 25

COKE TIN PLATE.

	Best	2d Quality.	Ordinary.
I C 10x14	$10 25 @ 10 75	9 50 @ 10 00	9 00 @ 9 25
I C 12x12	10 50 @ 10 75	(Out)	
I C 14x20	10 50 @ 11 00	10 50	

TERNE PLATE.

	Prime Char.	2d quat.	Coke.
I C 14x20	$10 00 @ 10 25	9 25 @ 9 75	8 25 @ 9 00
I X 14x20	12 00		
I C 20x28	20 50 @ 21 00	19 00 @ 20 00	17 50 @ 18 00
I X 20x28	25 50		
I C 20x20	23 75		

ZINC—DUTY: Pig or Block, $1 50 per 100 lbs. Sheet 5½c. ₩ lb.

Sheet	cask 10½c
"	open 10½c

Old Metals.

(Dealers' Selling Price.)

Copper	@ 20
Yellow metal	14 @ 15
Brass	13 @ 14
Heavy Composition	14 @ 15
Old lead, solid	6 @ 6¾
Tea lead	5
Wrought iron	1½ @ 1¾
Sheet iron	0¾ @
Cast iron	1 @ 1¼
Machinery iron	1¼ @
Zinc	5 @ 5½
Pewter, No. 1	17
" No. 2	10 @ 12
Spelter	5 @

Paints, Oils, etc.

Paints.

Black, lamp—Coach Painters	₩ lb 3c
" " Ordinary	4c
" Ivory Drop, fair	4½c
" " best	5c
Black Paint, in oil	kegs, 8c.; asst'd cans, 11 c
Blue, Prussian, fair to best	50 @ 70c
" " " in oil	35 @ 60c
" Chinese, dry	35c
" Ultramarine	25 @ 3 c
Brown, Spanish	1¼c
" Van Dyke	7c
Carmine, 40	$12 @c
Green, Chrome	15 @ 25 c
" " in oil	18 @ 2 c
" Paris	good, 30c; best, 40c
" " in oil	" 39c " 45c
Mineral Paints	1¼ @ 4c
Orange Mineral	14c
Red Lead, American	9¾c
" English	10½c
" Venetian (N. C.) dry	2¾c
" " in oil	asst'd cans, 11c; kegs, 8¾c
" Indian, dry	10c
Rose Pink	12c
Sienna, American, Raw	4c
" Burnt	4½c
" " in oil	16 @ 20c
" Raw "	15 @ 20c
Umber, Burnt	4 @ 5c
" " in oil	16 @ 21c
" Raw	3½ @ 7½c
" " in oil	16 @ 22c
Vermillion, Chinese	
" English	1 87 gold
" Trieste	1 65 "
" American, Common	23c
White Lead, American, pure dry	10c
" " in oil	11c
White, Paris, English, prime	in bbls. 2½ @ 3c
Yellow Ochre, French	2½ @ 3½c
" " in oil	asst'd cans, 11c; kegs, 8½c
" " Vermont	in casks 1½c
" Chrome	17 @ 27c
" " in oil	18 @ 28c
Zinc White, American No. 1 dry	8c
" " in oil	11c
" French (Paris)	11 c
" " in oil	12 c

Oils.

Linseed Raw	₩ gal. casks, 71c. obl., 72c
" Boiled	" 76c. " 76c
Whale, Crude	"
" Bleached Winter	" 80c
Sperm, Crude	" 1 65
" Winter, unbleached	" 1 85
" " bleached	" 1 90
Seal, Extra Refined	"
Lard, Pure Winter	" 1 30
" Spring	" 1 20
Cotton Seed, Crude	" 60c
" Southern Yellow	" 65c
" White	"
Neatsfoot, Winter	70c @ $1 10
Natural Lubricating	32c @ 40c

Sundries.

Asphaltum	¾c
Benzine	₩ gal. 16c
Chalk	1½c
" Block	
Dryer, Patent, Am'n	asst'd cans, 10 c.; kegs 9c
" " English	" " 11c.; " 9c
Flocks	
Frostings	50c
Glue, White	35 @ 40c
" Sheet	40c
Glaziers' Points, Zinc	8c
Gum, Copal	30c
" Damar	25c
" Shellac, English	85c
" " " dark	55c
Litharge	10c
Pumice Stone, selected Lumps	4 @ 6c
" powdered	1c
Putty in bladders	3½c
" in bulk	3c
Rotton Stone, soft, English	8c
Spirits Turpentine	41c
Whiting, Spanish	1c

Glass.

French Window—1st, 2d, 3d, and 4th qualities. Per box of 50 feet.

SINGLE THICK.

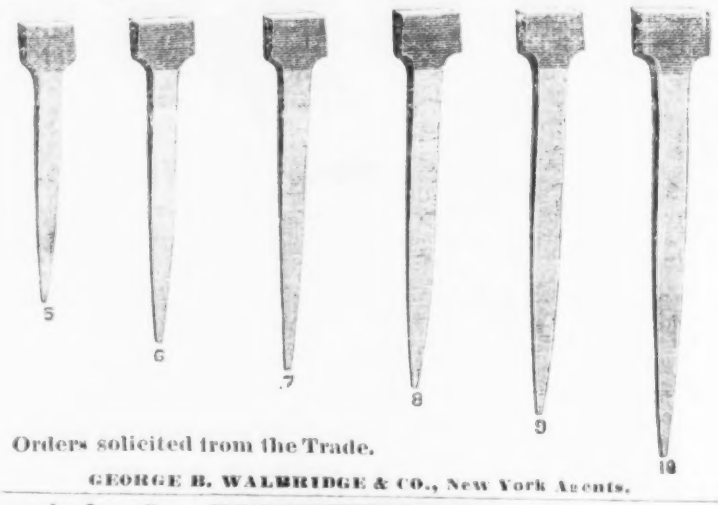
SIZES.	I.	II.	III.	IV.
6 x 8 to 10 x 15	$7 50	$6 75	$6 25	$5 75
11 x 14 to 16 x 24	8 50	7 75	7 25	6 75
18 x 22 to 20 x 30	10 75	9 75	8 75	7 75
15 x 36 to 24 x 30	12 25	10 75	9 00	
26 x 28 to 24 x 36	13 00	11 50	9 75	
26 x 36 to 26 x 44	14 50	13 25	10 75	
26 x 46 to 30 x 50	15 00	14 00	11 25	
30 x 52 to 30 x 54	16 00	14 75	12 00	
30 x 56 to 34 x 56	17 25	15 50	13 50	
34 x 58 to 34 x 30	18 25	17 25	15 00	
36 x 60 to 40 x 60	20 75	18 75	17 25	

DOUBLE THICK.

SIZES.	I.	II.	III.	IV.
6 x 8 to 10 x 15	$12 00	$11 00	$10 00	$9 25
11 x 14 to 16 x 24	13 75	12 50	11 75	10 50
18 x 22 to 20 x 30	17 25	15 25	14 00	
15 x 36 to 24 x 30	19 75	17 25	14 50	
26 x 28 to 24 x 36	21 00	18 50	15 75	
26 x 36 to 26 x 44	23 25	21 25	17 25	
26 x 46 to 30 x 50	24 00	21 50	18 00	
30 x 52 to 30 x 54	25 75	23 25	19 25	
30 x 56 to 34 x 56	27 75	25 00	21 75	
34 x 58 to 34 x 60	29 25	27 75	24 00	
36 x 60 to 40 x 60	33 25	30 00	27 75	

Sizes above—$12 00 per box extra for every 5 inches.
An additional 10 per cent. will be charged for all Glass more than 40 inches wide. All sizes above 52 inches in length, and not making more than 80 united inches, will be charged in the 84 united inches bracket.
Discount 40&10 @ 50 %.

PRATT & CO.,
Hardware & Iron Merchants, Buffalo, N. Y.
Manufacturers of the Superior Brand,
BUFFALO FORGED HORSE NAILS.
These Nails are superior, being made with new and improved machinery and actually hammered from the very best brands of **Norway Iron.**



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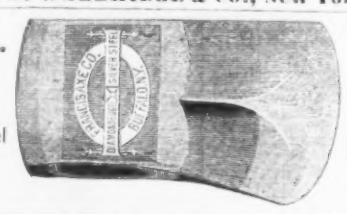

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Not the "Cheapest" but the BEST.

THIRTEEN SIZES AND KINDS.
GEARED.
For Family Use.

No. 19	2 quarts.

Grindstones, Emery, &c.

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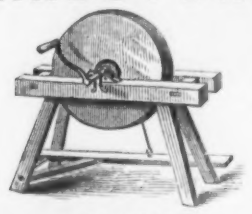
GRINDSTONES.



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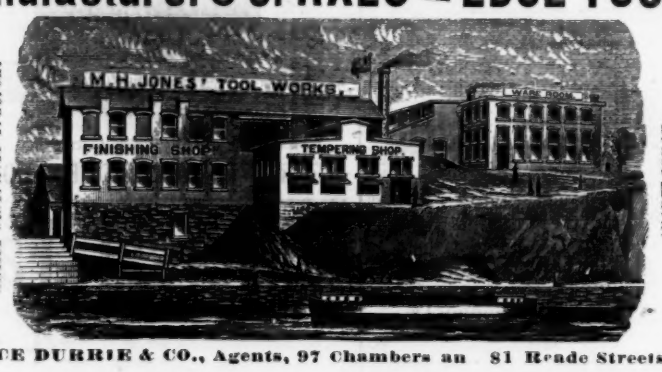

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PATENT HAMMER POINTED AND FINISHED
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FROM

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Orders promptly filled at lowest market rates.

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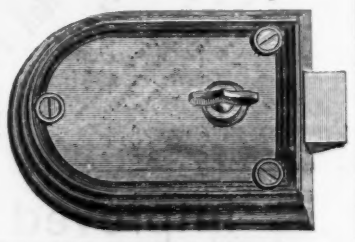

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Which are stronger than steel, ***and cannot be affected by rust,*** and will remain bright and clear under all ordinary circumstances.

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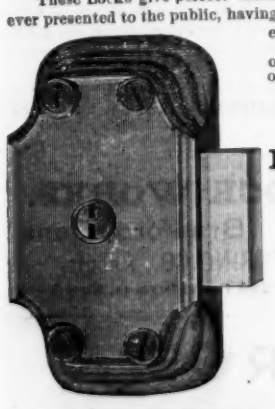
Each tumbler bearing on the key at two different points while locking or unlocking, without the aid of springs, which cannot be said of any other patent Tumbler Locks in use.



THE LOCKS ARE FITTED TO THE KEYS,

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For Stationary and Marine Engines.

WARRANTED

The Most Perfect Steam Governor in the World.

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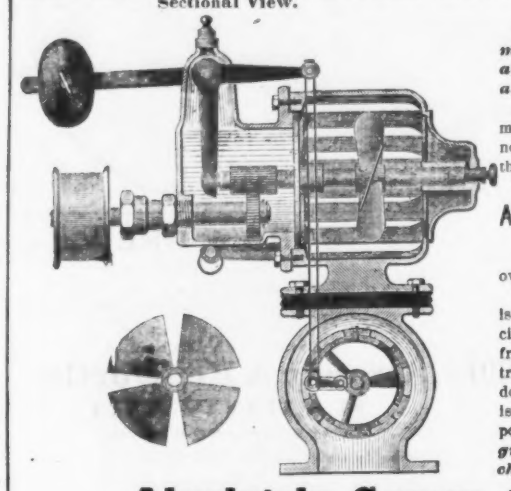

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The use of this Governor insures

A positive saving in Steam of from 10 to 20 per cent.

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This Governor possesses no characteristics in common with others, either in principle or operation. We refrain, therefore, from entering into comparisons. The Centrifugal or Ball Principle is entirely abandoned in this invention, and the valve lever is sustained with the same velocity in one position as another. ***No matter how great, violent or sudden may be the changes of load,*** we warrant it to

Absolutely Govern the Engine,

which will run uninfluenced by the varying pressure of steam, be it thirty or eighty pounds.

In a moment's time the revolutions of the driving wheel can be changed to exactly the speed required without stopping any of the mechanism, remaing perfectly governed wherever set.

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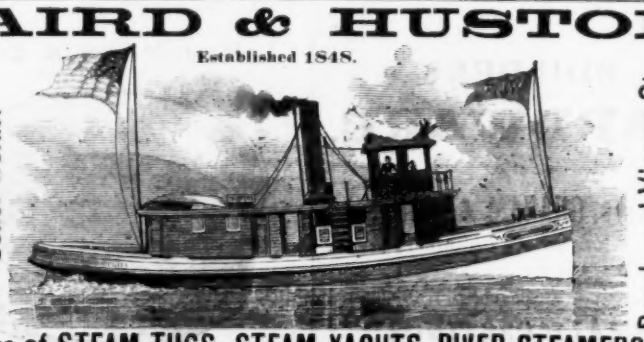

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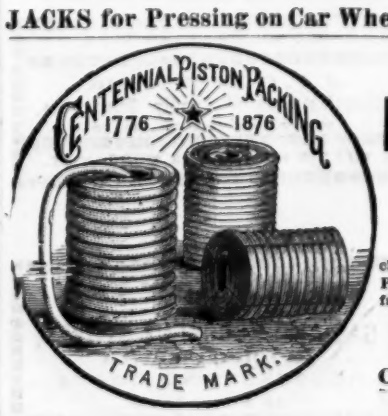
JACKS for Pressing on Car Wheels or CRANK PINS made to order



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Hemp Piston Packing

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Recommended by Master Mechanics and Engineers, as the cheapest and best in market. **No more Extortionate Prices. No more Fluted Rods**—but a good article at fair price.

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Steam Pumps,

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No auxiliary valves used. Direct connection between piston rod and valve movement. No knocking or jarring. Circulars and price lists sent upon application.

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EXTRA PARTS FURNISHED PROMPTLY.

☞ I am also prepared to furnish anything in the line of Gear Cutting from 5½ feet to ¾ of an inch in diameter, any shape of tooth desired; Racks, Worms, Worm Wheels, Screws any size or number of threads to the inch, Wood Planing, Iron Planing, Large Lathe Work, Gear Cogging, Shafts, Hangings and Pulleys, also all kinds of Mill Work, Jobbing, and Machinery in general.

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Particular attention paid to Experimental Machinery. We aim to maintain our reputation for doing work well.

CROSSLEY'S Patent Lubricator GLOBE VALVES, &c.

Corner **Adams & John Sts., Brooklyn, N. Y.**

Bennett Hotchkiss and N. C. Stiles' Patent.

This Drop (which has been illustrated in this journal of that class in which the Hammer is raised by a stiff belt or board passing up between two friction rolls, and is so well known that we will only describe our improvements. The patents we are working under are those of BENNETT HOTCHKISS (who in an interference case with Goulding and Cheney was declared the first inventor) and N. C. STILES. Our improvements consist:

First.—Of an arrangement of parts that makes it the most complete Jobbing Hammer, and will take the place, to a great extent, of all other kinds for forging. In addition to the upright rod, which is operated by the hammer to open and close the rolls, we place another rod the lower end of which is secured to the end of a lever which is operated by the hand or foot, which operation also opens and closes the rolls at will. The lower end of this rod has a slot, so that the action of the hammer will not disturb the hand lever, thereby preventing the hand being injured, as otherwise would be the case.

Second.—No dog is used on the upright to hold up the hammer. The belt or board passes up between two clamps located under the rolls, so arranged that as the hammer rises they will freely open of themselves, but on descending they will close and hold up the hammer. To let the hammer fall the clamps are opened by pressure upon the foot treadle.

Third.—The board or belt is secured to the hammer by an elastic connection, which prevents the sudden jar and destruction of the same. The back roll is made adjustable to different thicknesses of board or belt, as also are the clamps. An adjustable collar on the upright rod allows the operator to obtain *any hight* of blow desired automatically. If one blow is wanted, press upon the treadle and remove the pressure as soon as the blow is given. Keep the foot upon the treadle and the blows will be repeated until the pressure is removed. If a blow of less hight than the collar is set for is required work the hand lever, which will give you any hight of blow desired. The hammer can be held up at any point below the collar by bringing the hand lever into action when the hammer is at the desired hight, so that the next blow can be given from a state of rest, of less hight than the collar is set for. This is a feature no other drop has; that is, the first blow struck can be of less hight than the second or third, and obtained from a state of rest. A gentle pressure upon the treadle will allow the hammer to go down slowly, but it will stop and remain suspended at any point as soon as the pressure is removed.

The clamps in holding up the hammer keep the board from touching either roll and prevents the same from being worn uneven.

Manufactured only by the

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PHILADELPHIA,
FOR
AMERICAN
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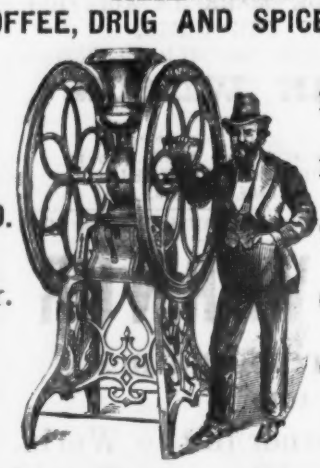

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Bung Hole Borers,
Tobacco Cutters,
Cheese Cutters,
Cork Pressers,
&c., &c.

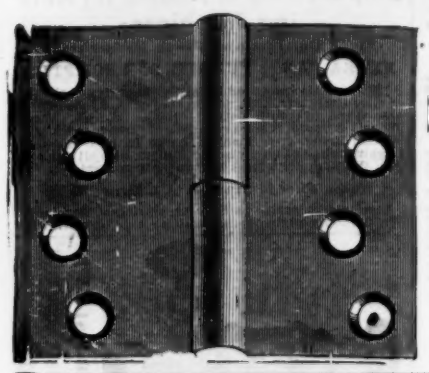
Send for Illustrated Catalogue and Price List
TO
ENTERPRISE MANUFACT'G CO.
PHILADELPHIA, Pa.,
Or to GRAHAM & HAINES, Agents,
88 Chambers St., N. Y.

THE
BEST and CHEAPEST MILLS
IN THE MARKET.

No Extra Charge
FOR
NICKEL-PLATED HOPPERS
WITH
EAGLE DOME TOPS.

WHEELING HINGE CO.,
Wheeling, West Va.,
Manufacturers of
Wrought Butts, Strap & T Hinges, Wrought Hooks, Hasps & Staples, Wrought Repair Links & Washers,
GRAHAM & HAINES, Sole Agents, 88 Chambers Street, N. Y.

AMERICAN BUTT CO.,
PROVIDENCE, R. I., Manufacturers of
Cast Butt Hinges,



AND
BUILDERS'
HARDWARE.
New York Warehouse with
Messrs. GRAHAM & HAINES,
No. 88 Chambers Street.
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All kinds of
SMALL CASTINGS
Made to order.

GEORGE T. RICHARDSON. FRANK H. SCUDDER.
Middleboro' Shovel Co.,
MANUFACTURERS OF
SHOVELS, SCOOPS & SPADES.

Office and Salesroom,
63 OLIVER STREET,
Works Middleboro, Mass. BOSTON.
J. CLARK WILSON & CO., New York Agents, 81 Beekman Street.

Coal

Hods.

Stamped Corrugated Sheet Iron Bottom Riveted.

We manufacture six styles having our patent corrugated bottom, and all having the body bottom and hoop riveted together. Dealers before buying will find it to their advantage to get our prices, and also to beware of a seamed hod that is in the market, somewhat similar in shape to ours. Don't buy any but the **Corrugated Riveted Bottom Hod**, manufactured by

SMITH, BURNS & CO., 46 Cliff St., N. Y.
Also Manufacturers of
Galvanized and Japanned Sheet Iron Goods, and Plain, Stamped and Japanned
TIN WARE.
FRY PANS, FIRE SHOVELS, ASH SIFTERS, &c. Send for Catalogue.

From 1841 to 1875.
GREENFIELD TOOL CO.,
Sole Manufacturers of the Celebrated
"Diamond" PLANE IRONS,
Of Uniform temper and Warranted.
PATENT FORGED OX SHOES. The only Shoe made with concavity to fit hoof. BENCH AND MOULDING PLANES of every description. Also, Plow and Match Bits, Moulding and Rabbet Irons, Plane Stops, Cutts Starts, Plates, &c., &c. Drop Forgings to order. Address for Catalogue with Stamp.
GREENFIELD TOOL CO., Greenfield, Mass. Reduced Prices for 1875.

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Plymouth, Mass.
Manufacturers of Copper, Brass, and Iron Rivets: Common and Swedes Iron, Leathered, Carpet, Lace and Gimp Tacks; Finishing, Hungarian, Trunk Clout and Cigar Box Nails, &c. Rivets made to O. G.
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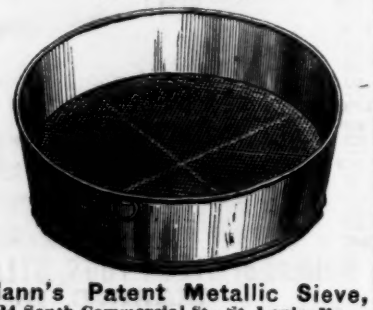
PLYMOUTH, MASS., manufacturer of
TACKS, BRADS, NAILS AND
RIVETS.
Swedes and Common Iron Tacks; Leathered, Carpet Brush, Lace and Gimp Tacks; Finishing, Hungarian, 2d, 2d and 3d Fine, Trunk, Clout, and Cigar Box Nails; Bright and Tinned Trunk Nails; Zinc, Iron, Copper and Steel Shoe Nails; Brads and Patent Brads; Glaziers' Points &c., &c., &c. **COPPER, BRASS AND IRON RIVETS**, of all kinds. Coopers' Rivets, from 1d to 6d, in casks of 100 lbs. each. Hose, Belt and Shoe Rivets and Burs. Oval and Countersunk Heads of extra lengths, made to order. SHIP AND BOILER RIVETS OF ALL SIZES AND LENGTHS

R. J. MANN & CO.,
Sole Manufacturers of



Mann's Patent Metallic Sieve,
24 South Commercial St., St. Louis, Mo.
The best sieve in use. To be had of all dealers.
A full assortment of these goods kept in stock at 88 Chambers Street, N. Y.
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Pope's Rifle
AIR PISTOL,
Recommended by Gen. Sherman.
Shoots Darts or Slugs
PERFECTLY ACCURATE.
No noise, as the force is Air alone.
Recommended and endorsed by the highest military authorities and the best Gun makers and dealers in the country.
SPLENDID PARLOR AMUSEMENT.
One may become a Dead Shot by practicing with it. To a Sportsman it is invaluable Price, including Darts, Slugs, Targets and Gunstock, $5. Handsomely Nickel Plated, $6. Self adjusting Bell Target, $2. For Sale by Gun dealers generally, or sent by mail on receipt of price. POPE BROS., Manufacturers, 45 High Street, Boston, Mass.

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AM. TEA TRAY WORKS,
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TIFFT & HOWARD, 12 MURRAY ST.

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TIFFT & HOWARD,
MANUFACTURERS OF
GAS AND KEROSENE STOVES,
AND PATENTED SPECIALTIES IN
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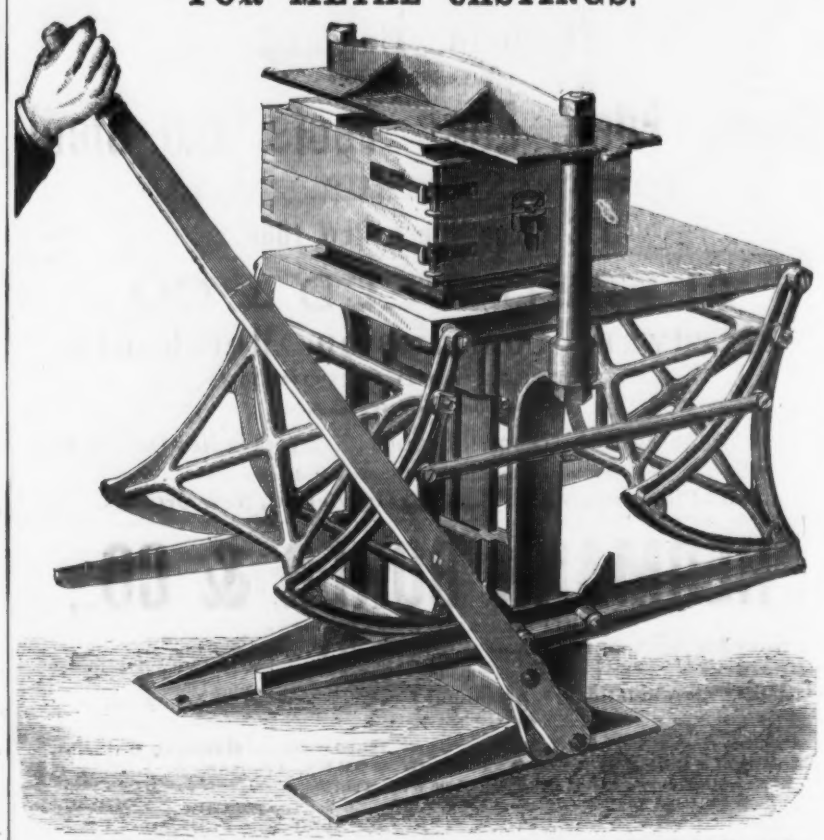
Eames' Pat. Molding Machine
FOR METAL CASTINGS.

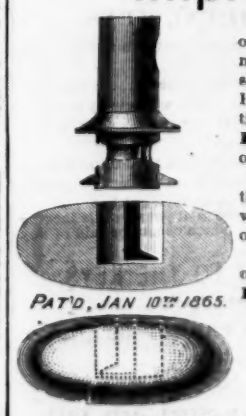


The above machines have recently been introduced in several large iron foundries in this country, where they have given entire satisfaction. Among the advantages are:
1st. A great saving in the cost of producing castings.
2d. A man can learn to mold with the machine in less than 30 days' time.
3d. The castings produced will be found more perfect, less poor work, and more uniform than if molded by the old method.
The machine is adapted for either Iron or Brass Castings. For further particulars, send for Circular. Address,
P. & F. CORBIN,
EXCLUSIVE LICENSEES.
Also Manufacturers of *Architectural Bronze Work, Locks, Hinges and fine Builders' Hardware generally.*
New Britain, Conn New York, 87 Chambers St.

THE
Hart, Bliven & Mead MFG. CO.,
18 & 20 Cliff and 243 & 245 Pearl Streets, New York.
Factories at KENSINGTON, CONN.

Manufacturers of
THE COMBINED NAIL DRAWER AND BOX OPENER.
The Best and Cheapest Patent Nail Puller made
SEND FOR CIRCULAR.
Our Catalogue and Appendix's now ready. Price $4.50, and charge remitted on receipt of subsequent orders.

Improved Door Knobs.



On the 10th January, 1865, we obtained Letters Patent for improved method of securing necks to Mineral and Porcelain Door Knobs, which improvement was used by us long enough to prove its utility, but on account of unsettled claim of joint ownership by former partner, its use was discontinued. Having now made a further improvement, for which we have made application for a Patent, we are now making the **BEST SECURED** and **MOST DURABLE** Mineral and Porcelain Door Knobs ever offered in this or other markets.
We solicit orders for these Knobs at our regular prices for old styles, with the understanding that if any can be loosened from or gotten off the necks without breaking the tops, they may be held by the purchaser subject to our order, with expenses added.
See *The Iron Age*, of August 21st., page 11, for illustrated description of our patent **Telescope Locks and Latches**, with patent Flat **Steel Perforated Keys**,
Address
BRANFORD LOCK WORKS,
Branford, Conn.
Or, THE HART, BLIVEN & MEAD MANUFACTURING CO., Agents,
18 & 20 Cliff and 243 & 245 Pearl Streets, New York

NEWCOMB BROS.
Manufacturers of
Smiths', Moulders' and Hand
BELLOWS.
For further particulars send for descriptive circular and price list.
586 Water St., near Montgomery N. Y
J. CLARK WILSON & CO., Agents, 81 Beekman Street, New York.

PHILADELPHIA.

(Corrected weekly by Lloyd, Supplee & Walton).

Terms, 30 days. For 60 or 90 days, interest added at 10 per cent. per annum.

Anvils.—Solid Cast Steel.....₩ ℔ 14c
Peter Wright's, (Advanced April 1st.) ₩ ℔, gold, 11½c
Wilkinson's.....“ 11c
Eagle.....list 11 cents—dis 20 @ 20&10 %
Apple Parers.—Union.....per doz $7 50
Skeleton.....“ 7 50
Victor.....“ 7 75
Domestic.....“ 7 75
Reading.....“ 7 75
Bay State Paring, Coring and Slicing.....“ 12 00
“ “ Peach Parers.....“ 10 50
Axes.—Mann's Light.....Per doz. $12 00 @ 11 50
Hunt's Light.....“ 14 00 @ 12 50
Red Indian, all sizes.....“ 12 00 @ 11 50
Red Chiercain, all sizes.....“ 12 50 @ 12 00
Crown Prince.....“ 12 50 @ 12 00
Augers and Auger Bits.—Pierce's Pat. Twist Bits.....dis 30 %
Douglass' & Ives' Bits.....dis 40&10 %
Connecticut Valley Auger Bits.....dis 40&10 %
Cook's Bits.....dis 40 10&10 %
Jennings' Bits.....dis 10 %
Bates' Nut Augers.....dis 40&10 %
Douglass' & Ives' Augers.....dis 40&10 %
Watrous' Ship Augers.....dis 10&15 %
Bonney's Pat. Hollow Augers.....dis 25 %
Stearns' Patent Hollow Augers.....dis 25 %
Balances.—
Landers, Frary & Clark's..... } Sold on Morton's new
Morton's..... } List.....dis 50 %
Chatillon's..... }
Common Spring with Hook.....₩ doz $1 38 @ 2 00
Bells.—Bevin Bros. Mfg Co. Light Hand Bells.....dis 70 %
Common (Tissue Paper Weight).....dis 70&10 %
Swiss Pattern Hand Bells.....dis 50 %
Connell's Door Bells.....dis 50&5 @ 50&10 %
Gt. Western & Kentucky Cow..dis 50&10 @ 50 10&5 %
Boring Machines.—Bates' Mfg. Co., complete with augers.....dis 20 @ 25 %
Douglas Mfg. Co., complete with augers..dis 20 @ 25 %
Common Boring Machines, no Augers.....$4 00 @ 3 75
Angular.....“ 5 00 @ 4 75
Bolts.—Eastern Carriage Bolts.....special prices
Western.....“ “
Philadelphia.....“ “ .....dis 60 %
“ Eagle, (Coleman's).....dis 60 %
Wrought Snutter, Stanley.....dis 50 @ 50&10 %
Braces.—Bayber's.....dis 40&5 %
Rackus.....dis50 %
Bartholomew's American Ball....dis 10&10 @ 15&10 %
Spofford.....dis 50 %
Butts.—Cast Fast Joint, Narrow....dis 25&10 @ 30&10 %
“ “ Broad.....dis 35&10 @ 40&10 %
Cast Fast Loose Joint.....dis 45&10 @ 50&10 %
“ Acorn, Loose Pin.....dis 4 5&10 @ 45&10 %
“ Mayers & Parliament.....dis 35&10 @ 40&10 %
“ Acorn Jap'd.....dis 40&10 @ 45&10 %
Wrought Loose Pin.....dis 35&10 %
“ Table Hinges and Back Flaps.....dis 30&10 %
“ Narrow.....dis 30&10 %
“ Loose Joint.....dis 35&10 %
Parker's Blind Butts.... }
Sheperd's “ .... } Discount 50&10 % by the case
Garretson's “ .... } 60 %.
Clark's “ ... }
Lull & Porter's }
Garretson's Blind Butts Light No. 0.... } Discount 60 %
“ Lull & Porter Pattern } By the case
Cherrytree Blind Butts } 60&10 %
Chains.—German Halter.....dis 20 %
“ Coil.....dis 20 %
Galvanized Pump.....net 13 @ 13½c
Best Proof Coil Chain—

₩ ℔...	14	10½	9	8½	8	8c gold
	½	5-16	⅜	7-16	½	⅝ in.

By the cask, 560 lbs., ¼c per lb. less Common Chain, ¾c per lb. less.
Chisels.—Socket Framing.....dis 60 @ 60&10 %
Socket Firmer.....dis 60 @ 60&10 %
Tang “ .....dis 40&10 @ 50 %
Beatty's Framing and Firmer.....dis 2 1%
Castors.—Iron Bed.....dis 30&10 @ 40 %
Porcelain Wheel Bed.....dis 30&10 @ 40 %
Iron and Brass Wheel Plate.....dis 40 @ 40&10 %
Porcelain Wheel “ .....dis 50 @ 50&10 %
Clothes Wringers.—Universal.....per doz $64 00
Novelty.....“ 64 00
Discount on 2 dozen lots. $2 per dozen.
Coffee Mills.—Common Box and Side.....dis 15 %
Patent Box and Side.....dis 15 %
Cutlery.—American Pocket (best).....dis 25 %
Landers, Frary & Clark, J. Russell & Co. and Lamson & Goodnow Mfg. Co. Manufacturers' net prices.
Drawing Knives.—Hart Mfg. Co.'s.....dis 60 %
Adjustable Handle.....dis 10 @ 15 %
Beatty.....dis 15 @ 20 %
Fry Pans.
Tinned.....dis 40 @ 45 %

₩ doz..	$2 50	4 00	4 50	5 00	7 50	8 50	7 50	9 00	10 00
No....	0	1	2	3	4	5	6	7	8

Burnished.....dis 0 @ 45 %

₩ doz..	$3 00	3 75	4 25	4 75	5 25	6 00	7 00	8 00	9 00
No....	0	1	2	3	4	5	6	7	8

Files.
Nicholson Mill Files.....new list
“ Bastard.....“
“ Taper.....“
Butcher's Mill (Advanced March 8th)...$5 25 to £ gold
“ Bastard.....5 25 to £ gold
“ Taper.....5 25 to £ gold
Fluting Machines.
K. F. M.—1¼ in. rolls, $5 50.....dis 15 %
“ —6 in. rolls $6 50.....dis 15 %
Mrs Knox—4 in. rolls, $8 25.....dis 20 %
“ —6 in. rolls, 7 00.....dis 20 %
Hammers.
Yerkes & Plumb's.....dis 15 %
Hammond & Son's.....dis 15 %
Verce.....dis 20 %
Hatchets.
Beatty's..... } ₩ doz...$1 00 1 50 1 75 3 00
dis 15 @ 20 %
Shingling and Half. } No.... 1 2 3
Yerkes & Plumb.....dis 15 %
Shingling and Half. } ₩ doz... $1 00 1 50 3 00 3 50
} No.... 1 2 3 4
Claw.... } ₩ doz.....$7 50 8 00
} No.... 1 2 3
Hinges.
Strap and T, (Changed March 24).....dis 45 %
Horse Nails.

Nos.	6	7	8	9	10
Ausable	27	25	24	23	22
Globe	28	26	25	24	23
Brundage	26	24	23	22	21
Nos.	5	6	7	8	9	10
Putnam	32	28	26	25	24	23

On Ausable, Globe and Brundage 1000 ℔ lots.....dis 5 %
Knobs.—Door, Mortise and Rim.
Makes in Combination.....new list dis 45&5 %
Extra discount for cash 2 %
Mineral and Rim.....dis 5 %
Locks and Latches.—Rim and Mortise.....dis 45&5 %
Extra discount for cash 2 %
Till and Cupboard.....dis 25 %
American Padlocks.....dis 50 %
Scandinavian Pad Locks,

₩ doz....	$10 50	10 50	12 00	12 00	15 00	15 00 } dis 15 %
No.....	9	9½	10	10½	11	11½ }
₩ doz.....	$13 00		15 00		22 00	22 00 } dis 15 %
No.....	12		12½		13	13½ }

Trunk Locks.....dis 5 @ 10 %
Thumb and Roggeas Latches.....dis 25 %
Lanterns.—Square Candle and Oil.....dis 10 %
Globe for Oil.....dis 10 %
“ “ Kerosene.....dis 10 %
Tubular Lanterns.....dis 10 %
Mattocks.—Long and Short Cutter.....dis 25 %
Western Pattern.....dis 25 %
Pennsylvania Pattern.....dis 15 %
Molasses Gates.
Enterprise Mfg. Co.'s Measuring Faucets.....dis 20 %
Stebbins' Gates.....dis 60&10 @ 65&10 %
Lincoln's “ .....dis 40&10 @ 50 %
Landers, Frary & Clark's Petroleum.....dis 15&10 %
Taylor's Petroleum Faucets.....dis 20&10 %
Brass Liquor Cocks.....dis 20&10 %
Meat Cutters.—Dixon's.....dis 15 %
Woodruff.....dis 15 %
Stowe.....dis 15 %
Hale's.....dis 25 %
Stuffers.....dis 10 %
Planes.—Auburn Tool Co., “Bench”.....dis 40 %
Second Quality.....dis 50 %
Metallic Plane Co.....dis 25&5 %
Evans Pat. Circular.....net
Plumbs and Levels.
Adjustable.....dis 60&10 %
Non-Adjustable.....2 3 60, 10&10 %
Plane Irons.—American.....list net
Butcher's.....gold £, $5 50
Picks.—Philadelphia.....net
Pittsburgh.....net
Rules.....dis 60, 10&10 @ 70 %
Rakes.—Cast Steel Garden.....dis 40 @ 40&5 %
Malleable Garden.....dis 40 @ 40&5 %
Wood Head Iron Teeth.....dis 40 %
Steelyards.—American Pattern.....dis 15 %

₩ doz....	$5 50	7 00	9 00	10 00	11 00	12 00
No.....	50	100	150	200	250	300

English Pattern.....dis 15 %

₩ doz.....	$7 00	9 67	10 67	12 67	14 67	16 67
No.....	50	100	150	200	250	300

L. F. & C. Excelsior.....dis 10 %

₩ doz.....	$9 00	10 00	12 00	15 00	18 00	21 00
No.....	50	100	150	200	250	300

Scythes.—Golden Clipper, Damascus Blade, Boxed and Sharpened.....₩ doz. $10 00 net
Golden Clipper No. 10, Boxed and Sharpened.....₩ doz $9 75 net
Green Clipper No. 5, Boxed and Sharpened.....₩ doz $9 50 net
Common Scythes.....₩ doz $7 50 @ 9 00
Squares.—Steel and Iron, new list.....dis 50 %
Saws.—Disston's Cross Cut.....dis 15 %
Disston's Hand.....dis 12½ %
W. McNeece's H'd, Cross-Cut & Circ'r, new list..dis 15 %
Boynton's Lightning, new list.....dis 40 %
“ Champion.....dis 45 %
Shovels and Spades.
Rowland's Plain Back, Jan. 3d.....dis 25 %
“ Back Strap “ .....dis 25 %
Oliver Ames & Sons.....new list dis 12½ %
Brady Shovel Co.....dis 12½&5 %
Sad Irons.—Richmond (polished face).....per lb. 3¾c
Richmond (polished face)... ....by the cask “ 3½c
Stone.—Arkansas Oil, No. 1.....₩ ℔ $1 75
Turkey Oil, No. 1.....“ 1 00
Washita Extra.....“ 50c
“ No. 1.....“ 22c
“ “ 2.....“ 18c
“ “ 3.....“ 5½c
Screws.—Iron.....new list, April 1st, 1875, dis 62½ %
Brass.....dis 52½ %
Spoons.—
Plated.....dis 40&10 @ 50 %
Britannia, Boardmans (new list).....dis 50&10 %
“ Parkers (old list)..dis 50 %
German Silver.....dis 30 %
“ Light.....new list dis 35 %
Lalance & Grosjean Iron.....dis 70 %
Springs.—Gray's Door.....dis 50 @ 50&10 %
Torry's Door.....dis 50 @ 50&10%
Stocks and Dies......dis 10&5 %
Stove Polish.—Gem.....₩ gross, $5 00
Onyx.....“ $5 00
Try Squares.—Winterbottom.....dis 10 @ 15 %
Stanley Rule and Level Co.....dis 45&10 %
Willis Thrall, No. 2.....dis 30&10 %
Disston's No. 2.....dis 40 %
Tacks, &c.—Half Weight Tacks.....dis 72½ %
“ “ “ by the case...dis 72½&7½ %
Clout and Finishing Nails.....7½ %
“ “ “ by the case.....dis 7½ %
Traps.—Genuine Oneida—Newhouse list.....dis 20 %
Imitation “ “ “ .....dis 30 %
Vises.—Solid Box, currency.....₩ ℔ net 14c
Wrenches.—Coes Genuine.....dis 40 @ 4½&5 %
Coes Imitation Wrought Bar.....dis 50&50 % 10 %
“ “ Malleable Bar.....dis 60&10 %
“ “ (Kellogg) Malleable Bar.....dis 60&10 %
Tafts Pattern (Wrought Bar).....dis 70 @ 70&10 %
Philadelphia Tool Co.'s Pat. Duplex.....dis 25 %
“ “ “ Improved Baxter.....dis 25 %
“ “ “ Adjustable Fork.....dis 25 %
Wire.—No. 0 to 18.....dis 47½ %
No. 19 to 26.....dis 55 %
No. 27 to 30.....dis 45 @ 47½ %
Copperedy to 12.....dis 15 @ 20 %
Tinned Broom Wire.....dis 25 %
Galvanized Wire No. 0 to 18.....dis 40 %

BUFFALO.

Reported by Messrs. Sidney Shepard & Co.
March 1, 1875.

Augers—Snell Mfg. Co.....dis 25 %
Bits, Auger—Snell Mfg. Co.....dis 25 %
Bells, Cow—Yaw's Genuine.....dis 20 %
Bolts—Carriage and Tire.....dis 75, 10&5 %
Braces—Bit, Spofford's Patent.....dis 50&10 %
Brads, Cut.....dis 50&7½ %
Boards—Stowe, Brooks' Patent.....dis 30 %
Butts—Brass.....dis 30 %
Wrought Narrow.....dis 30&10 %
“ Broad, Loose Joint.....dis 35&10 %
“ Table and Back Flaps.....dis 30&10 %
Wrought Butts, Loose Pin.....dis 35&10 %
Belting—Rubber.....dis 30 @ 35 %
Leather, new list, oak tanned.....dis 20 %
Brick—Bath (box of 2 doz) Best English.....$1 25
“ Rutherford “ $1 00
Cases—Parlor Coal Hod.....dis 10 %
Chalk—White, Carpenter's.....₩ gross, 57c
Red, Carpenter's.....“ 90c
Blue, “ .....“ $1 00
Chisels—Firmer Socket.....dis 60&10 %
Framing Socket.....dis 60&10 %
Corner Socket Chisels.....dis 60&10 %
Slick's Carpenters'.....dis 60&10 %
Castings—Malleable.....₩ ℔ 10c
Elbows—Corrugated..... 5 5½ 6 7 } dis 10 %
Charcoal.....$3 50 4 50 5 25 6 50
Russia.....7 00 9 50 12 00 14 00
Files—Malschoss Bros.....dis 50 %
Fluters—Geneva Hand.....dis 50 %
Freezers Ice Cream—“ Champion.....₩ doz. $15 00
Hammers—Henry W. Kip's.....dis 30 %
Hinges—Window Blind—
Clark's.....dis 55&10 %
Shepard's and Standard.....dis 55&10 %
Wrought Strap and T.....dis 45 %
Rods, Coal—Plain, Black and Galvanized.....dis 10 %
Funnel, Black and Galvanized.....dis 10 %
Fancy and Helmet.....dis 10 %
Hooks and Staples—Wrought.....dis 10 %
Hooks—Belt.....dis 70&10 %
Hasps and Staples—Wrought.....dis 50&10 %
Sad Irons.....dis 70&10 %
Kettles—Brass.....3¾c
Enameled.....₩ ℔, 45c
Knives, Drawing—Oval No. 1.....dis 50&5 %
Razor Blade.....dis 60&10 %
Lanterns “Peerless.”.....dis 50&10 %

No.	1	5	10
₩ doz	$6 00	$10 50	$15 75

Tuyuiar..... dis 10 %
“ with Guards.....
Machines—Apple Paring, “Turn Table”.....$7 00 ₩ doz
Mills, Coffee—Box and Slide, common.....dis 15 %
Box Union and Eagle.....dis 15 %
“American.....dis 20 %
Nails—Clout and Finishing.....dis 7½ %
Shoe.....dis 7½ %
Horse, Ausable.....No. 5 6 7 8 9 10

	30	27	25	24	25	22c
“ “	Pointed & Polished					add 1c ₩ ℔
“ “	1000 lbs.					dis 5 %
“ Clinton	No.	6	7	8	9	10
		21	19	18	17	16c

Packing—Rubber.....dis 30 @ 35 %
Case lots.....dis 20 %
Paint—White Lead, U. S. Gov't.....₩ ℔ 8½c
Rivets—Iron, Black and Tinned.....dis 25&7½ %
Rope—Manila, ½ inch and larger.....₩ ℔ 14½c
Sisal, ½ inch and larger.....11½c
Jute, all sizes.....9½c
Screws—“American Screw Co”—
Flat Head, Iron.....dis 52½ %
Flat Head, Brass.....dis 52½ %
Spoons, Iron Tinned.....dis 10 %
“ by the case.....dis 20 %
Plated Rogers' A No. 1.....dis 5 0 %
Britannia.....dis 45&10 %
Squares—Steel and Iron.....new list 50 %
Scales—Buffalo Scale Works.....dis 25 %
Fairbanks.....dis 15 %
Stove Polish—Gem.....₩ gross, $4 50
“ Dixon's.....“ 6 00
Trans. Steel—Newhouse.....dis 20 %
Tacks—Half Weight Am. Iron.....dis 72½&7½ %
Vases—Palace Coal.....dis 10 %
Vises—Parallel, Buffalo.....dis 25 %
Ware—French, Tinned and Iron.....dis 25 %
Stamped and Japanned.....dis 5 %
Cast Iron Hollow.....dis 40 %
Tin Plates.—Add for each X.....2 50
10x14, IC, Charcoal...$12 00, 14x20 C, terne.....$11 00
12x12, “ ... 12 50 } 20x28 C, “ 22 75
12½x17, “ ... 11 50 } 20x28 X, “ 21 25
14x20, “ ... 13 00 }
Pig Tin—Straits.....28c @ 29c
Bar Tin.....30c
Solder.....No. 1, 16½c; No. 2, 15½c
Sheet Zinc—
“ Lasalle”.....570 100 ℔ casks
$10 75 11 05 ₩ 100 ℔s
Sheets.....$11 25
Iron Wire—Bright and Annealed.....dis 45 %
Coppered.....dis 40 %
Tinned.....dis 30 %
Tinned Broom, } Nos. 20 21 22 } dis 25 %
} 20c 21c 21c }
Copper—Sheathing 14 @ 18 oz.....₩ ℔ 31c
Planished.....₩ ℔ 36c @ 38c
Bottoms.....₩ ℔ 32c
Bolts.....₩ ℔ 33c
Braziers' Sheets.....₩ ℔ 33c
Sheet Iron.—
18 Common.....$4 30
24 Common.....4 50
24 W. D. Wood & Co., Smooth Finish.....5 20
Am. Russia.....A. B.
14c 11c
Gen. Russia, No. 1 stained.....18c
“ “ clean.....19c
Galvanized.....dis 30 %

CINCINNATI.

Reported by Sellew & Co., Importers and Jobbers Metals, No. 214, 216 and 218 Main street.

Tin Plate.—I. C. 10x14 Charcoal.....$11 50 @ 12 50
I. X. 10x14 Charcoal.....14 50 @ 15 50
I. C. Terne 14x20.....10 50 @ 12 75
I. C. Terne 20x28.....21 00 @ 23 50
I. C. Continuous.....24 00
Block Tin.—
Pig.....₩ ℔ 27c @ 29c
Bars.....₩ ℔ 31c
Solder.—
S. & Co.....₩ ℔ 23c
A 1.....“ 19c
Roofing.....“ 17c
Lead.—Pig.....₩ ℔ 7½c.
Bar.....₩ ℔ 8½c
Copper.—
Ingot.....₩ ℔ @ 24c
Planished.....“ @ 30c
Sheathing.....“ @ 33c
Sheets, 6 to 9 lb.....“ @ 33c
“ 10 to 12 lb.....“ @ 32c
Braziers, 13 lb.....“ @ 32c
Copper Bottoms.....“ @ 34c
Zinc. Casks, 500 to 1000 lbs.....₩ ℔ 10½c
Case, 100 lbs.....“ 11 c
Slab.....“ 7½c
Brass.—Rod, No. 26 to 30.....₩ ℔ 30c
Roll, No. 14 to 38.....“ 35c
Roll, No. 6 to 40.....“ 37c
Wire, No. 20.....“ 35c
“ 26.....“ 40c
Babbit Metal.—Sellew & Co.....“ 32c
Allens'.....“ 30c
Market.....“ 12c
Antimony.....₩ ℔ 17c
Bismuth.....₩ ℔ $4 00
Nickel.....₩ ℔ $3 50
Sheet Iron.—Gen. Russia.....₩ ℔ 20c
Planished A.....₩ ℔ 18c
“ B.....“ 13½c

	Com. B.	Fin. S.	I. U.	Smooth D	Re'fd.
15 to 20	4·4c	5·5c			7·8c
22 to 24	4·6c	5·6c			7·6c
26	4·8c	5·8c			7·8c
27	5·0c	6·0c			8·0c

Galvanized Iron.—Full bundles.....dis 20 %
Nos. 18 to 20.....13c | No. 26.....14c
22 to 24.....13c | 27.....15c
Bar Steel.—Silver, ₩ ℔ 16c; Crescent, 21c.
Iron Wire.....dis 35 %
Enameled Ware.....dis 45 @ 50 %
One Piece Corrugated Elbows......dis 10 %

Charcoal Iron.		Russia Iron.	
4½ inch.....	₩ doz $2 50	4½ inch.....	₩ doz $3 00
5 “	“ 3 00	5 “	“ 7 00
5½ “	“ 4 00	5½ “	“ 9 50
6 “	“ 5 25	6 “	“ 12 00
7 “	“ 6 50	7 “	“ 14 00

Leader Elbows, Flat Crimp Retinned or Galvanized.—Dis. 10 %

	₩ doz.		₩ doz.
2-inch.....	$1 75	2½-inch.....	$2 75
3-inch.....	2 25	3½-inch.....	3 25
4-inch.....	2 50	4½-inch.....	3 50

Sheet Iron Bread Pans.....₩ ℔ 10c
American Broilers.....₩ doz. $13 50
Tinmen's Machines.....dis 5 %
Sad Irons.....₩ ℔, 3½c
Brass Kettles.—Ansonia.....45c
Dog Irons.....8½c

PITTSBURGH.

The following are the Card rates of Lewis, Oliver & Phillips, H. B. Newhall, 11 Warren St., New York, Agent. Iron, standard list assorted sizes, for large orders, c. card rate, 2 % off net.
Flat Rail (1¼x¼), punched and coun'sunk..4·4c ₩ ℔ net
Iron Wedges.....4½c ₩ ℔ net
Norway Nail Rods.....9¼c ₩ ℔ net
Crow Bars (in ordering please state whether “Wedge” or “Pinch” point).....5c ₩ ℔ net
Beetle Rings.....8½c ₩ ℔ net
Fence Pickets—
⅝ round, bent to shape, 80c ₩ ft. of fence, less 15 % off net.

	Discount off Standard List.
Carriage and Tire Bolts (new list).....	70&10 % off net
Plow Bolts.....	30, 10&5 % off net
Stove Bolts.....	15 % off net
Machine and Square Head Bolts.....	30&10 % off net
Coach and Lag Screws.....	50&10 % off net
Bolt Ends.....	35 % off net

Pat. Hot Pressed Square and Hexagon Nuts, small sizes, from 3-16 to ⅝ in.....7½c ₩ ℔ off net
Pat. Hot Pressed Square and Hexagon Nuts, large sizes, from 7-16 to 2 in.....6 c ₩ ℔ off net
Washers, all made from new band iron, small sizes, from 3-16 to ⅝ in.....6 c ₩ ℔ off net
Washers, all made from new band iron, large sizes, from 7-16 to 1⅛ in.....7 c ₩ ℔ off net
Nuts and Washers in 25 lb. boxes, 1c ₩ ℔ ex. Nuts and Washers in lots less than one keg each size, 1c ₩ ℔ ex. Nuts and Washers in 5 lb. boxes, 1½c. ₩ ℔ ex.
Harrow Teeth, in lots of 1 ton or more, packed in casks, 1 in. diam. 3¼c ₩ ℔ net; ⅞ ¾ in. diam. 3¼c ₩ ℔ net; ⅝ in. diam. 4c ₩ ℔ net.
Patent Headed Harrow Teeth, packed in casks, ¾c ₩ ℔ ex
Skein Bolts, in bulk, in lots of 1 keg or more, ⅝ in. diam. 5¼c ₩ ℔ net; 9-16 in. diam. 6¼c ₩ ℔ net; ½ in. diam. 7½c ₩ ℔ net. 1c ₩ ℔ extra when less than 1 keg of each size is ordered.
Screw Hook-and-Eye Hinges, ¾ to 1 in. diam. 9c ₩ ℔ net; ⅝ in. diam. 10c ₩ ℔ net; ½ in. diam. 12 c ₩ ℔ net.
Screw and Strap Hinges, in lots of 100 pairs or more, 14 to 36 in. long, 5½c ₩ ℔ net; 8, 10 & 12 in. long, 6½c ₩ ℔ net
Strap and T Hinges.....20 & 10 % off net, delivery as customary.
For purchases amounting to $250 between May 30th and December 31st, 5 % extra off.
Screw Hitching Rings.....$5 25 ₩ 100 net
Duck Nest Tuyere Irons.....$14 50 ₩ doz net
Cast Iron Washers.....₩ ℔ 4c net
Bridge and Roof Bolts—
1 to 2 in. diam. over 8 ft. long.....₩ ℔ 4 c net
1 to 2 in. diam. from 4 to 8 ft. long.....“ 4¼c net
1 to 2 in. diam. from 1½ to 4 ft. long.....“ 4½c net
⅝, ¾ and ⅞ in. diam. over 4 ft. long.....“ 4½c net
⅝, ¾ and ⅞ in. diam. from 1½ to 4 ft. long.....“ 5¼c net
Bridge bolts with upset ends.....5c. ₩ ℔ extra
Wrought iron plates, punched.....5c. ₩ ℔ net

WAGON HARDWARE.

Wagon Box Strap Bolts—

10 in. long by 7-16 at Screw End,				₩ set of 8 bolts..		55c
12	“	½	“	“ 8	“ ..	70c
10	“	9-16	“	“ 8	“ .. }	90c
12	“	9-16	“	“ 8	“ .. }	
14	“	9-16	“	“ 8	“ ..	$1 00
10	“	⅝	“	“ 8	“ .. }	1 00
12	“	⅝	“	“ 8	“ .. }	
14	“	⅝	“	“ 8	“ ..	1 10
16	“	⅝	“	“ 8	“ ..	1 20

5c ₩ set for each additional inch over 14 in. All lengths made.
In ordering Box Strap Bolts please give diameter at Screw End.
Wagon Box Rods, narrow track, each.....18c
“ “ wide track, each.....20c
Single Tree Irons, ₩ set of four pieces.....55c
Wrought Iron Bolster Plates, 2¼ in. wide, ₩ set.....60c
“ “ 3 “ “ “ 65c
“ “ 3¼ “ “ “ 70c
“ “ 3½ “ “ “ 75c
Wagon Brake Ratchets, each.....16½c
“ “ “ finished with guard, each..45 c
Wrought Hammer Straps, heavy pattern, each.....16 c
“ “ “ light “ each.....13½c
“ Rub Irons, each.....11 c
Stay Chain Hooks, each.....8 c
Double and Single Tree Clips, figure 1, each.....9 c
“ “ “ “ 2, each.....10 c
“ “ “ “ 3, each.....12 c
Strap Bolts, Rods, Single Tree Irons, Bolster Plates, Brake Ratchets, Hammer Straps, Rub Irons, Stay Chain Hooks and Clips, in lots of 50 sets.....dis 25 %
Wagon Box Staples, 1¼ to 2½ in. to clinch, ₩ 1000.$11 00 net
“ “ “ Bevel Box Iron, to rivet on, ₩ 1000 7 50 net
Neck Yoke Eyes, each.....4½c net
“ “ with ⅝ rings, each.....7½c net
King Bolts, ⅝, 1, 1⅛, and 1¼ in. diam.....₩ ℔ 4½c net
Wagon Rivets, ex. large, flat, oval and steeple head, ¼ in. diam. all lengths.....“ 8½c net
Wagon Rivets, 5-16 in. diam., all lengths.....“ 9½c net
“ & Nails, in 5 ℔ paper boxes....₩ ℔ 1c extra
“ “ in 25 ℔ wood “ .... ½c extra
Wagon and Hinge Nails, ¼ in.....₩ ℔ 12 c net
“ “ “ 5-16 in.....“ 19 c net
Double Tree Plates.....“ 8½c net
Coupling “ .....“ 5½c net
Tongue “ .....“ 9 c net
Neck Yoke Plates.....“ 11 c net
Tongue Cap Iron, 1¾, 2 & 2¼ in. wide, same price ₩ ℔ as Band Iron.
Wagon Chains, Stay Lock and Tongue, 5-16 in. ₩ ℔ 10½c net. ¼ in., 11½c. net

DETROIT.

(Reported by Messrs Jewett & Root.)

Tin Plate.—Best Charcoal

IC, 10x14.....	$12 00
IX, 10x14.....	14 75
XX, 10x14.....	17 00
IC, 12x12.....	12 50
IX, 12x12.....	15 25
IC, 14x20.....	13 00
IX, 14x20.....	15 75
XX, 14x20.....	18 50
XXX, 14x20.....	21 25
XXXX, 14x20.....	24 00
DC, 100 Plate.....	11 50
DX “	14 25
DXX, “	17 00
DXXX “	19 75
DXXX X 100 Plate..	22 50
IX, 14x14.....	24 00
IC, 10x14 W.....	11 50
IX, 10x14 W.....	14 25

Roofing Tin.—Best Char.

IC, Terne, 14x20.....	$11 00
IX, “ 14x20.....	13 75
IC, Terne, 20x28	13 00
IX, “ 20x28	16 00

Coke Tin.—

IC, 10x14 Coke.....	$10 25
IX, 10x14, Coke	13 00
IC, 14x20, “ ...	11 25

Pig Tin.—

Large Pigs.....	28c
Small Pigs.....	29½c
Bars.....	30c

Solder.—No. 1..... 16c
No. 2..... 15c
Sheet Zinc.—
In any quantity.....10½c
Bright Wire.
63 lbs. in bdl....dis 40 %
Copper.—
Sheathing.....31c
Copper Bottoms.....32c
Planished Copper.—
Sheathing, 14x48.....38c
Boiler Size, No. 7.....40c
“ “ No. 8.....40c
“ “ No. 9.....40c
Sheet Iron.—
No. 18 Am. Com.....4 40
No. 24 Am. Com.....4 60
No. 26 Am. Com.....4 80
Patent Planished Russia, Nos. 24, 25 and 26....14c
Genuine Russia, No. 9, 10, 11 and 12.....18c
Broken bdls. ½c. extra.
W. D. WOOD'S & CO.'S SHEET IRON.—
Nos. 15 to 20 Smooth $5 85
“ 21 to 24..... 6 05
“ 25 & 26..... 6 25
“ 21 to 24 Char'l.. 7 95
“ 25 & 26 “ .. 7 75

Send 50 cents for 6 samples (Prepaid) of
HAMMOND'S WINDOW SPRINGS,
For supporting and locking upper and lower sashes of all windows. Not a coiled spring, but one *forged* from best materials.
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Lewisberry, York Co., Pa.

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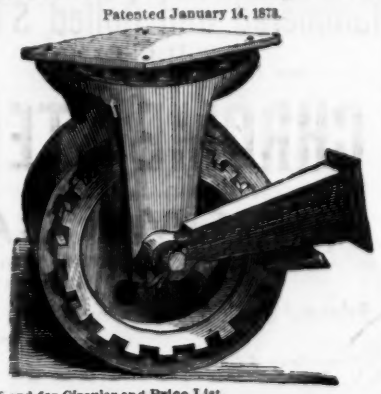
Erdless-Lever House & Weight Mover.
Patented January 14, 1873.



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Incorporated, Oct., 1874. Reliable State Agents Wanted.

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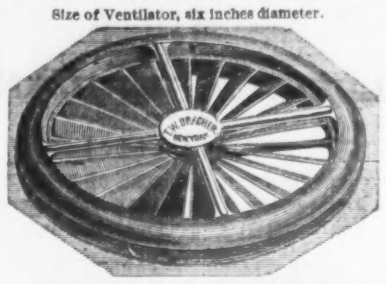
i. e., Ventilators are now made with
GLASS AGATES, LIKE WATCHES, FOR STEEL AXLES TO REVOLVE IN, AND HAVE A REGULATOR ATTACHED AND ARE MUCH IMPROVED.
Will Prevent Show Windows from Sweating (by partly equalizing inside and outside air) and Supply Pure Air without Draft.
IN BEDROOMS, OFFICES, STUDIES, SCHOOLS, &c., &c.
Size of Ventilator, six inches diameter.
Construction Entirely New.



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Patented U. S., Nov. 10th and 24th, 1874, and ENGLAND, FRANCE and AUSTRIA.
Samples (Nickel and Gilt) sent by mail on receipt retail price, $2·50, inclosing instructions of a new and ready method for inserting in glass in a few minutes. The difference between retail and trade price for sample will be allowed on next order.
T. W. BRACHER, 77 Greene Street, New York.

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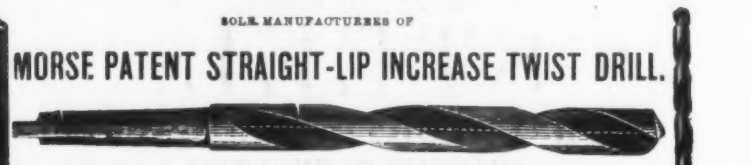
New Bedford, Mass.,
SOLE MANUFACTURERS OF
MORSE PATENT STRAIGHT-LIP INCREASE TWIST DRILL.



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ALSO MANUFACTURE
SOLID AND SHELL REAMERS.
All Tools exact to Whitworth's Standard Gauge.
DRILLS MADE TO FIT ANY SOCKET DESIRED.
EDWARD S. TABER, Treasurer.

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RAILROAD TRACK TOOLS
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An Oil-Tempered Steel Spring that takes up Expansion of the Bolt, and keeps a perfectly tight joint. Solid Steel Tamping and Clay Picks.

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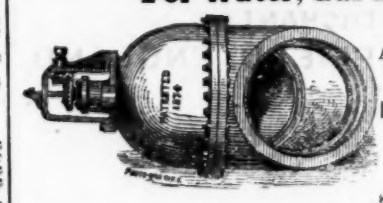

From 2 in. to 50 in. diameter.
Also, **Fire Hydrants, Single and Double Nozzle.**
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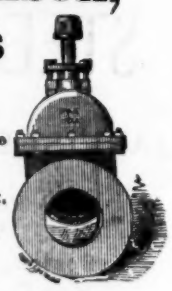

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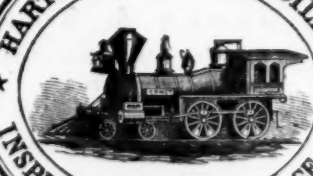

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Warranted most SUPERIOR and UNSURPASSED for

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WARRANTED SUPERIOR TO ANY STEEL IN THE MARKET—EITHER ENGLISH OR AMERICAN—FOR EVERY PURPOSE.

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CAST STEEL,

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All descriptions of Cast and German

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Elliptic and Side Springs, Seat Springs.

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The superiority is well known of our brands Rifle Powder

Orange Rifle, Orange Ducking
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THE BEST IN THE WORLD

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HUSSEY, WELLS & CO.

MANUFACTURERS OF ALL DESCRIPTIONS OF

CAST STEEL,

INCLUDING

Best Refined Steel for Edge Tools.

PARTICULAR ATTENTION PAID TO THE MANUFACTURE OF STEEL FOR

Railroad Supplies, Homogeneous Plates

FOR LOCOMOTIVES, BOILERS AND FIRE BOXES,

Smoke-Stack Steel, Cast Steel Forgings for Crank Pins, Car Axles, &c.

ALSO, MANUFACTURERS OF THE CELEBRATED BRAND

"Hussey, Wells & Co. Cast Spring Steel,"

For Elliptic Springs for Railroad Cars & Locomotives.

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ESTABLISHED IN 1845.

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MANUFACTURERS OF

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Cast and German Plow and Spring Steel,

FIRST AVE., AND ROSS ST., PITTSBURGH.

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Nos. 74 and 75 North St., Boston. A. B. PARKER, 12 Cliff Street, New York.
W. F. POTTS, SON & CO., 1225 Market Street, Philadelphia.

FARIST & WINDSOR,

BRIDGEPORT, CT., 1872.

WINDSOR LOCKS, CT., 1860.

ALL DESCRIPTIONS OF

CAST STEEL

made to order for Cutlery, Dies, Agricultural Implements, Decarbonized Steel, Frog Plates and Points, Steel Forgings to Pattern. Quality equal to the best. Prices as low as the market admits.

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LABELLE STEEL WORKS.

SMITH, SUTTON & CO.,

MANUFACTURERS OF ALL KINDS OF

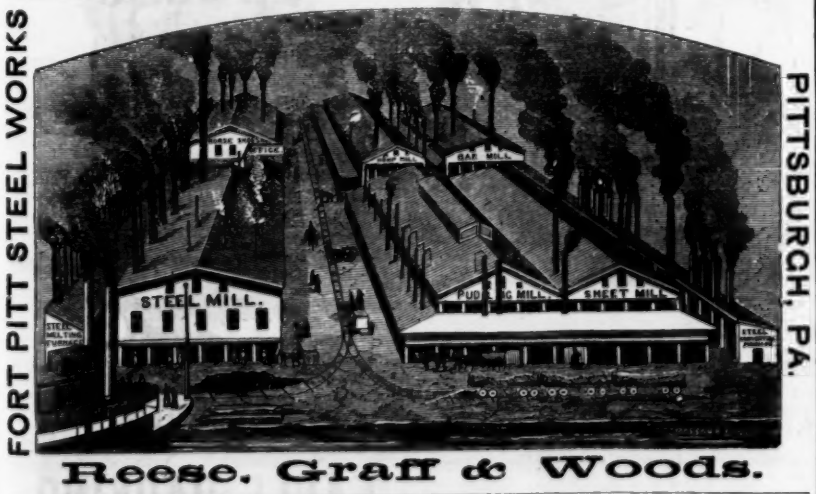
STEEL.

Also, Springs, Axles Rake Teeth, &c.

OFFICE & WORKS, Ridge, Lighthill & Belmont Sts., & Ohio River, Allegheny.

Post Office Address, Pittsburgh, Pa,

FORT PITT STEEL WORKS



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AGENCIES IN BOSTON AND PHILADELPHIA.

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New England Chain Works

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Manufacture **Iron Chain** of every description.

Mowing Machine, Crane, Break Draft Chains, &c., &c.

Also, Latest Improved Cotton Can Rings.

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Bellows Factory and Planing Mill.

ESTABLISHED 1852.

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Contractor, Builder

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SASH, BLINDS, DOORS,

Cisterns, Tanks, Stairs, Hand Rails, Newels, Mirror Frames, Mantels, Curtain Cornices, Book Cases, Veneered Doors, Mouldings, and complete interior and exterior finish for houses.

ROUGH AND PLANED LUMBER,

Flooring, Siding, Shingles, Lath and Fence Posts.

Blacksmiths' & Moulders' Bellows.

TUCKER & DORSEY, Manufacturers,

Indianapolis, Ind.

CHICAGO.

(*Reported by Frank Sturges & Co., 72, 74 & 76 Lake St.*)

Tin Plate.—

10x14, IC, Ch'l. Good.	$	14x20, IX, Ch'l Best.	$15 50
10x14, IC, " Best.	12 00	14x20, IXX, " "	18 00
10x14 IX, " "	14 50	14x20, IXXX, " "	20 50
12x12, IC, " "	12 50	DC, 100 Plate, " "	12 00
12x12, IX, " "	15 00	DX, " "	14 50
14x20, IC, " "	13 00	DXX, " "	17 00
Roofing IC, Charcoal, Best		DXXX " "	19 50
Roofing IX, Charcoal "			11 50
20x28, IC, Charcoal Roofing, Com			14 00
20x28, IC, " " Fair			22 00
20x28, IC, " Best			22 50
20x28, IX, " "			26 00
10x14, IC, Coke Plates			27 50
14x20, IC, "			10 00 @ 10 50
10x20, IC, "			10 50 @ 11 00
			17 50

Block Tin.—

Large Pigs	30c	Bars	32c
Small	31c	Straits, 2c. higher.	

Zinc.—Sheet, 500 to 1000 lb. Casks 10¾c
Common Sheets 11c
Slab Zinc or Speiter 6¾ to 7¼c

Copper.—Bottoms 35c
Sheathing 33c
Planished 38c
" Boiler lengths 40c
Ingot 24c to 26c
Bolt 33c

Braziers' Sheets.—

30x60, 6 to 8 lbs.	₩ lb 28c	30x60, 15 to 100 lbs.	₩ lb 32c
30x60, 10 & 12 lbs.	" 25c		

Solder.—F. S. & Co.'s make.

Best Fine	22c
No. 1	20c
Roofing	18c
Braziers' or Spelter Solder	32c to 35c

Antimony 16c
Babbit Metal—F. S. & Co.'s 16c
No. 2 14c

Sheet Iron.—

	Common.	Smooth. Com.	Smooth Charcoal.	Smooth Juniata.
No. 24	4¾c	6 c	7¼c	9¼c
25 & 26	5 c	6¼c	7¾c	9¾c
27	5¼c	6¾c	8 c	10 c

Galvanized Iron dis 25 %

No. 16 to 20	12c	No. 27	15c
21 to 24	13c	28	16c
25 & 26	14c		

Russia Iron.—

Perfect	19c	No. 1 Stained	
		In Sheets, 1c. higher.	

American Russia.—

A	14c	B	11c
		In sheets, 1c higher.	

Lead.—

Pig	7½c	Lead Pipe, in full coils	8¼c
Bar	8½c	Lead Pipe, when cut	8½c
		Sheet Lead	8½c

Wire—Bright dis 35 %
Copperas dis 50 %

BOSTON.

(*Reported by Macomber, Bigelow & Dowse, 156 to 164 Oliver St.*)

Augers.—Watrous Ship dis 10 %
L'Hommedieu Ship dis 15 %
Axes.—Forester's Favorite, Bronzed $12 00
Blue Jackets, blue 11 5
Excelsior, Black 11 00
Chopper's Pride, Bronzed 10 50
Red Cross, Red 10 00
Red Cross, Handled 12 50
Boy's Handled Blue Jackets 12 00
Axe Handles.—Wadleigh's Oak—
A (Extra) $2 50. B (No. 1) $2 00. C (No. 2) $1 50 ₩ doz
Bells, Sleigh—
Fancy Body, Patent Leather, Cloth Bound, White Metal, 30, No. 1 $1 70
Fancy Body, Patent Leather, Cloth Bound, White Metal, 26, No. 1 1 80
Fancy Body, Patent Leather, Leather Bound, Extra Tinned, 32, No. 1 2 38
Fancy Body, Patent Leather, Leather Bound, Extra Tinned, 36, No. 1 2 50
Fancy Body, Patent Leather, Leather Bound, Silver Plated, 30, No. 1 3 38
Fancy Body, Patent Leather, Leather Bound, Silver Plated, 36, No. 1 3 50
Shaft, Strap, White Metal, House Bells, extra, 6, No. 1 per pair, 60c.
Common, 5, No. 1 45c.
Blind Hinges.—
Orr or Washburn's per hundred sets $3 50
Blind Pasts.—
Orr or Washburn's per hundred set $6 00
Bolts.—Carriage, Phila. "Girard Works" dis 50&10 %
Borax.—Best Refined ₩ lb 14c
Borers.—Angle, Backus' dis 30 %
Boring Machines.—Angle each $4 75
Common, Snell's quality each 3 75
Braces.—Barber's dis 40&5 %
Backus' dis 50 %
Spofford's dis 50 %
Ambion dis 50 %
Brackets.—Star Bronzed dis 50&10 %
Star Japanned dis 60&10 %
Store Shelf dis 55 %
Brass Faucets.—L. F. & C. dis 25 %
Butts.—Union Drilled Loose Joint dis 45&10 %
" " Wire Fast Joint dis 25&10 %
" " Acorn Loose Joint dis 40&10 %
Brass Butts dis 30 %
Wrought Table Butts and Back Flaps dis 30&10 %
Wrought Narrow Butts dis 30&10 %
Can Openers—Sprague's dis 50 %
No. 1, Iron Handle $4 00
No. 2, Wood Handle 4 50
Cartridges.—" U. S. Cartridge Co." dis 50&10 %
Chisels.—"Buck Bros." Shank Goods add 20 @ 22½ %
Socket add 22½ @ 25 %
Churns.—Lightning—
Redheffer patent. 3 4 5 6 gall
per doz $22 00 $27 00 $31 50 $36 00
Coal Hods dis 35 %
Fancy Japanned, No. 4, 15 in., $8·00; 5, 16 in., $9·00; 6, 17 in., $10·00.
Fancy Galvanized, No. 4, 15 in., $11·50; 5, 16 in., $13·00; 6, 17 in., $14·00.
Perfection, Jap'd, No. 4, 15 in., $12·00; 5, 1 in., $13·00; 6, 17 in., $14·00.
Perfection, Galv'd, No. 4, 15 in., $15·00; 5, 16 in., $16·00; 6, 17 in., $17·00.
Morning Glory, Jap'd, No. 4, 15 in., $12·00; 5, 16 in., $13·00; 6, 17 in., $14·00.
Morning Glory, Galv'd, No. 4, 15 in., $15·00; No. 5, 16 in., $16·00; No. 6, 17 in., $17·00.
Compasses and Dividers.—Bemis' dis 35 %
P. S. & W. dis 25 %
Cordage.—Manilla (usual trade dis.) ₩ lb, 14½c
American Tarred Hemp Lath Yarn ₩ lb, 10c
Corn Hooks per doz $2·75
Cow Ties dis 10 %
No. 30, Open Ring, 3 foot, No. 6, with Toggle $3·70
No. 35, " 3 " No. 6, " Snap 3·90
No. 40, " 3½ " No. 5, " Toggle 4·25
No. 45, " 3½ " No. 5, " Snap 4·40
No. 50, " 4 " No. 4, " Toggle 4·95
No. 55, " 4 " No. 4, " Snap 5·00
No. 60, " 4½ " No. 3, " Toggle 5·60
No. 65, " 4½ " No. 3, " Snap 5·80
Crow Bars.—Iron. Steel Points ₩ lb, 5¼c
"Sweet" Steel Bars ₩ lb 11c
Brown's Steel Bars ₩ lb 10c
K. P. & Co. Extra Drill Steel ₩ lb 15c
Dividers.—Cook's Nickel Plated dis 15 %
Door Springs.—Stimson's Patent.—
No. 1, Light inside doors, $12·00 dis 25 %
No. 8, " outside " $18·00 dis 25 %
Torrey's $4·00
Egg Beaters.—Lightning, Redheffer pat. 1 qt. 2 qts.
per doz $8 00 $12 00
Emery.—Alden ₩ lb 6½c
Wellington Mills ₩ lb 10c
Files.—Karl Smith & Co.'s English $5 to £ gold
American $5 to £ currency, less 12½ %
Nicholson new net list
Wheeler, Madden & Clemson .25 net
Stubb's Tapers, genuine, 3 in., $1·50; 3½, $1·62; 4, $1·88; 4½, $2·13; 5, $2·50.
Funnel Irons.—$2·50 2·50 2·50 3·25 per doz
5, 5½, 6, 7 inch.
Deep Flange.—$3·50 3·75 4·00
5, 5½, 6 inch.
Hammers.—Maydole dis 5 %
M., B. & D., solid cast steel, adze eye, No. 1, $10; 1½, 9·50
" " " " " bell face, No. 1, $11; 1½, $9·75.
Hangers & Rollers.—Novelty dis 30 %
Anti-Friction $1 75 per pair—dis 30 %
Hatchets.—Underhill Edge Tool Co. dis 15 %
C. F. Dowse, warranted Cast Steel—
Shingling 0, $4·75; 1, $5·25; 2, $5·75
Claw 1, 5·75; 2, 6·25
Lathing 1, 4·50
Axe Pattern 1, $7·00; 2, 7·50
Broad 0, $5·25; 1, $5·50; 2, $7·50; 3, $9·25; 4, $10·75; 5, $12·75; 6, $14·75.
Hinges.—Strap and T, Stanley Works dis 35&10 %
Plate, Loose and Fast Joint ₩ lb 6c
Wrought Screw Hook ₩ lb 6½c
Knobs.—Young's Imp. Silverd Glass dis 50 %
Lanterns.—Tubular No. 0 $9·50
Guarded. No. 74, (with kerosene oil and candle burners) 6·25
Lead.—Sheet and Pipe 9c—less 10 %
Locks.—Norwalk Lock Co dis 45&5 %
Mattocks.—
K. P. & Co. axe finish, long cutter $13 00—dis 10 %
Snort cutter 12 75—dis 10 %
Meat Cutters.—" Miles's" Challenge dis. 20 %
No. 1, $22·00; 2, $30·00; 3, $40·00.
Metal.—Babbitt, No. 1, 35c; 2, 25c; 3, 16c; 4, 15c ₩ lb
Nails.—10d and larger—dis 15c 100 keg lots $3 50
Nail Pullers.—Little Giant—Small per doz., $22·00
Little Giant—Large " 30·00
Padlocks.—Wilcox dis 45&5 %
All Brass, 2½ inch, 2 keys, job lot $9 00
Paper.—Tar'd Sheathing ₩ lb 2 c
Dry Sheathing " 3½c
" " "Beaver Brand" Rosin Sized " 4½c
Tar'd " " " 3½c
Felt " " " 4½c
Picks.—
K. P. & Co. Axe Finish ₩ doz 5 to 6 $8·50; 6 to 7 $9·00
" " Solid Eyes 5 to 6 $9 00, 6 to 7 $9 50
Pins.—Universal Hat and Coat all wood—
2 in. ₩ gross $2 50; 3 in., 3 50; 4 in., 4 50—dis 15 %
Potato Digger.—
"Partridge," 6 square tine ₩ doz $12 00
Shumway & Co., 6 round tine ₩ doz 9 00
Pulleys.—Axle 1¼ No. 15, 31c; 1¼ No. 18, 33c; 1¾ No. 28, 42c; 2 No. 29, 46c.
Nashua, Bronzed Face 1¼, 30c; 2, 90c
Steel Axle " " 2, $1·00
Pulley Blocks.—" Best Boston Make" net
Common Strapped Blocks—

5	6	7		Inch.
Single, 75c.	85c.	$1·00	$1·13	each.
Double, $1·00	1·12	1·25	1·60	"

Inside Iron Strapped Blocks—

5	6	7	8	9	10	Inch.
Single, $1·00	1·13	1·25	2·00	2·25	1·75	each.
Double, 1·63	1·80	2·63	3·63	4·00	5·00	"

Inside Iron Strapped Blocks, with Patent Roller Bushings—

5	6	7	8	9	10	Inch.
Single, $1·25	1·50	1·88	2·50	2·85	3 50	each.
Double, 2·50	3·00	3·38	4·63	5·00	6·50	"

Plated Ware.—Rogers bros dis 50 %
Plumb & Levels.—" Davis" Pat. Adjustable—
No. 1, Iron and Wood Center Levels dis 50 %
No. 2, First Quality Levels dis 60&10 %
No. 3, Iron Pocket dis 35 %
No. 4, Level and Plumb Glasses dis 60&10 %
No. 5, Iron Pocket Levels, per square and straight edge dis 50&10 %
No. 6, Improved Iron Bench Planes dis 40&10 %
Pocket Knives.—Conn. Cutlery Co new net list
American Shear Co dis 33⅓ %
Rail Barn Door.—For Novelty and Anti-Friction Hangers per foot 7c., dis 30 %
Rivets.—Black dis 25 %
Carriage, oval head, Nos. 3, 4, 5, 6, 7, 8,
13 13 14 14 15 16c ₩ lb net
Rubber Moldings.—" Harmon's" dis 10 %
No. 2, for Windows per foot, 5c
No. 3, for Doors per foot, 10c
No. 4, " per foot, 12c
Sad Irons.—Bliss & Drake ₩ lb 3¾
Sand Paper.—0 to 2, $4·25; 2 to 3, $4·75 dis 10 %
Saws.—*Hand and Panel—*
Wheeler, Madden & Clemson's, same list as "Disston's" dis. 15 %
Disston's dis. 12½ %
Cross Cut—
Wheeler, Madden & Clemson X Cuts per ft., 37c
" " " "Star" X Cuts. " 60c
" " " Champion X Cut. " 50c
" " " One Man X Cut each, $2·25
Boynton's genuine Lightning X Cut per ft., 60c
" " " One Man X Cut each, $2·25
Circular—Wheeler, Madden & Clemson's dis. 25 %
Mill— " " " dis. 25 %
Screws.—American Screw Co. revised list dis 62½ %
Aiken's dis 60&10 %
Scythe Stones.—
"Willoughby Lake," first quality ₩ gross $4·50
" second quality 3·00
Shovels.—O. Ames new list dis 12½ %
M. B. & D. new list dis 12½ %
Snow, Malleable Iron Tip, D Handle—Agents for New England $6·50
Snow, Malleable Iron Tip, long Handle—Agents for New England 5·50
Sifters.—Coal, Rice, &c $12 00
Spading Forks.—M. & F. dis 25 %
Stone Pickers.—"Partridge," original ₩ doz $15 00
Tools.—Aiken's Pattern, 20 in set; Parr's $8·00 per doz
Traps.—Oneida dis 30 %
Blake's dis 30 %
Vises.—K. P. & Co.'s Solid Box, Blacksmith ₩ lb 13c
Parker's Parallel dis 10 %
Backus dis 25 %
"Howards." Parallel dis 20 %
Wardrobe Hooks.—Wire to drive ₩ gross $1 00
Weather Strips.—" Harmon's" per doz ft., dis 10 %
Weights.—Window Weights ₩ lb 2½c
Wedges—Axe ₩ doz 38c
Wire.—
Eureka, in spools, No. 28 to 40 assorted ₩ gross $3 50
Wire Netting.—Clinton Wire Cloth Co., Green, Drab or Black ₩ ft 5½c
Wrenches.—Genuine Wrenches, G. A. Coes dis 40&5 %
Walton dis 50 %
Wringers.—
Novelty and Universal, Tub No. 2, Less than 2 doz. $64 00; 2 doz or more, $2 00
Bench A less than 2 doz $82 00; 2 doz or more $80 00
" B " " 90 00 " " 88 00
" C " " 108 00 " " 105 00
Eureka per doz $58 00
Withington, Cooley & Co.—
Hoes, Rakes, Forks, &c dis 33⅓ %

Boston Metal Market.

(*Corrected by Fuller, Dana & Fitz.*)

Tin Plates.—₩ box
I. C. Char. 10x14 @ $9·25
I. C. Coke 10x14 9 00
Char. Roof. IC, 14x20, 10 75
Coke " IC, 14x20, 10 25
Pig Tin.—₩ lb
Banca 31c
Straits 24¼c
English 24½c
Zinc.—Sheet ₩ lb 10½c
Copper.—
Sheathing 30c
Bolt 32c
Ingot 22c
Lead.—₩ lb
Pig 7¼c
Sheet & Pipe 8½c
Spelter ₩ lb 7¼c
Antimony " 13c
Iron.—Sheet Iron, Russia " 17c
Sheet Iron, English " 5 :
" " American Refined " 5¼c
" " Galvanized " 10c
Plate Iron " 3¾c
Swedish and Norway Bar Iron gold ₩ ton, $130 00
" " Shapes gold 127 50
Norway Nail Rods, first quality, gold 140 00
" " second " 132 50
Best Refined Bar Iron 61 50
The "Burden Best" Iron 110 00
American Pig Iron, Foundry, No. 1 X 34 00
" " No. 2, X 31 00
" " Gray Forge 27 00
Scotch Pig Iron ₩ ton 36 0 @ 40 50
Wrought Scrap Iron 34 00

Steel.—

	₩ lb		
Eng. Tool	19c	German	10c
American Tool	14¾c	Spring	8 c
" Mach	10c	Tire	6¾c
Pessemer	7¾c	Sleigh Shoe	4¾c
		Toe Calk	8 c

ST. LOUIS.

Corrected weekly by Semple, Birge & Co.

Apple Parers.—Conqueror ₩ doz, $1 75
Hudson's Rotary " 7 75
Axes.—Wm. Mann's, Red Warrior ₩ doz $11 50
Wm. Mann's, W. Stewart's 11 00
" C Marshall " 10 50
" Handled " 15 00@18 00
" Double Bitted " 2 30
H. L. B. & Co.'s, L. & Co. " 11 30
" Pioneer " 12 00
" James & Co. " 11 00
Hunt's " 12 00
Axles.—"Jones, Henry & Co.'s" Patent Lubricating, Half Patent, Swelled Taper, Plain Taper and Concord Axles dis 10 & 5 %
Common Axles (Pat. Lubricating), 1⅛ inch and upward ₩ lb, 6¾c.
do. less than 1⅛ inch " 7 c.
Bellows.—Best St. Louis make 60c ₩ in. dis 20&2½ %
Bells.—Troy, Church, School and Farm Bells ₩ lb 42c
"Improved Amalgam Bronzed," 15 in., $3·00; 17 in., $4·00; 19 in., $6·00. dis 10 %
Belting.—"Boston Belting Co.'s" Rubber dis 30 %
"Bradford & Sharp's" Oak-Tanned Leather dis 20 %
Bolts.—Arms, Bell & Co.'s Carriage and Tire dis 75 %
Arms, Bell & Co.'s Machine dis 20 %
Butts.—Western Butt Co.'s new list—
Narrow Fast Joint dis 25&10 %
Broad Fast Joint dis 35&10 %
" Loose " dis 45&10 %
Reversible dis 40&10 %
" Japanned and Silver Tipped dis 40&10 %
Loose Joint "Acorn" " " dis 40&10 %
Wheeling Hinge Co.'s W't Fast Joint Narrow dis 30&10 %
" " " Broad dis 35&10 %
" " Loose Joint dis 35&10 %
" " Reversible dis 35&10 %
" " Table & B'k Flaps 30&10 %
Churns.—Julian, No. 2, $7·00; No. 3, $7·50; No. 4, $8·50 dis 20 %
Corn Knives.—Dunn E'ge Tool Co.'s Chip 5 75
Seymour Mfg. Co.'s Solid Steel Back 5 00
Corn Shellers.—Sandwich Mfg. Co.'s—
Power Shellers dis 10 %
Hand Shellers Special rates
Cotton Gins.—Dubois Patent dis 10 %
Crow Bars.—Steel Pointed ₩ lb 6¾c
Drag Saw Machines.—
Culver's Iron Drag Saw dis 10 %
Robinson's Patent Sweepstakes Drag Saw dis 10 %
Fanning Mills.—Nash & Cutt's dis 15 %
Feed Cutters.—Improved Burdick National dis 15 %
Sanford No. 1, $12 00; No. 2, $8 75 net
Files.—Black Diamond, Mill $5·00 £ currency.
" Bastard 5·00 £ currency.
" Taper 5·00 £ currency.
Forges.—Keystone Portable Forge Co.'s dis 12½ %
Forks and Hoes.—
Auburn Mfg. Co.'s Hay and Manure Forks dis 33⅓ %
" " Handled Hoes dis 35⅓ %
Garden Seed Drills and Wheel Hoes.
Allen's Double Wheel Hoe dis 15 %
" Planet Drill, Nos. 2 and 3 dis 15 %
" Combined Drill and Wheel Hoe dis 15 %
Grinding Mills.—French Burr Mills net list
Challenge Feed Mills dis 30 %
Sedgebeer's Nonpareil Mills dis 10 %
Osage Corn and Cob Mill dis 20 %
Hammers.—Masons' Hammers ₩ lb 20c
Smiths' Hand 23c
Handles.—No. 1 Fork, Hoe and Rake dis 20 %
No. 2 Fork, Hoe and Rake dis 40 %
Harrow Teeth.—1 inch iron ₩ lb 4½c
⅞ and ¾ inch iron " 4¾c
Barbed or Headed ½c extra
Hay and Cotton Presses.—
Dederick's Railroad dis 5 %
" Perpetual net
Hay Knives.—
Dunn Edge Tool Co.'s ₩ doz $15 00—dis 15&5 %
Lightning (Weymouth's Patent) ₩ doz $30 00
Hinges —
Wheeling Hinge Co.'s Strap & T dis 5', 10&5 %
Horse Hay Fork.—Nellis' Harpoon dis 20 %
Horse Nails.—National Patent Polished 20c rates
National Patent Polished, extra finished 22c
Horse Powers.—Pitts or Carey's Patent dis 10 %
Wheeler's Railway dis 10 %
Sandwich Lever dis 10 %
Horse Rasps.—Heller Bros dis 45 %
" Black Diamond" $5 00 to the £ currency
Horse Shoes.—
Rhode Island (Perkin's Pattern) ₩ keg, $6 25
" Mule " 7 25
" Trotting Shoes " 9 75
Tredegar Horse per keg $6 25
" Mule per keg 7·25
Hose.—
Boston Belting Co.'s Rubber Medium Sizes dis 35&5 %
" " ¾x2 inch dis 25&15 %
Ice Tools.—W. T. Wood & Co.'s Saws new list net
W. T. Wood & Co.'s Chest Hatchets new list net
" " Axes new list net
" " Loading Tongs new list net
" " Medium, Small and Family Tongs new list net
" " Chisels, Hooks and Grapples new list net
Lawn Mowers.—Archimedean dis 20&5 %
Charter Oak dis 20 %
Mattocks and Grub Hoes.—
Klein, Logan & Co.'s Mattocks ₩ doz $14 75 @ 15 25
" " Grub Hoes, oval eye " 10 75 @ 12 00
Money Drawers.—
Pierpont & Co.'s Excelsior per doz $40·00 net
Nails.—Wheeling $3 30 rates
Packing.—Boston Belting Co.'s Rubber, Plain dis 30 %
Boston Belting Co.'s Rubber, Pure dis 25&5 %
" " No. 2 Plain dis 40 %
" " Round and Square dis 10&10 %
Picks.—Klein, Logan & Co.'s Railroad and Clay ₩ doz $10 50 @ 11 75
Klein, Logan & Co.'s Coal " 8 00 @ 9 00
" " Foil " 12 00
" " Stone " 15 00
" " Tamping " 17 50
Plows.—Avery's Cast and Steel dis 15 %
Collins Cast Cast Steel new list net
Perkin Steel new list net
Post Hole Augers.—Clark's Patent—
No. 1, ₩ doz. $27; No. 2, $30; No. 3, $32 dis 20 %
Pulleys—5 inch per doz $4·25 net
4 inch per doz 3·25 net
Nellis' Patent new list dis 10 %
Rake.—Paddock's Premium Sulky $20 00 net
St. Louis Revolving 14 tooth 5 50 net
" " 16 " 6 00 net
" Hay Rake dis 10 %
Reaper & Mower Guard Sections.—
Geo. Barnes' Co.'s Knives dis 20&5 %
" " Sections dis 25 %
Road Scrapers.—Steel dis 25 %
Cast Iron dis 10&2½ %
Sad Irons.—Monitor Brand, Silver Polished ₩ lb 5c
Sash Weights.—Standard Solid Eyes ₩ lb 3½c
Saws.—Branch, Crooks & Co.'s dis 15 %
Curtis & Co dis 10 %
Scythes.—Dunn Edge Tool Co.'s new list dis 20&5 %
Scythe Stones.—No. 1 Ind'n Pond ₩ gr's, $7 00 } dis 25
Extra Indian Pond " 7 50
Premium " 10 50
Diamond Grit " 13 00
Shovels and Spades.—Myers & Armor dis 15 %
O. Ames & Son dis 5 %
Grain Scoops, (Pat. Corrugated Straps) M. & A. dis 15 %
" " T. Rowland's dis 15 %
" " O. Ames & Son dis 5 %
Sledges.—Smith's Stone or Coal Sledges—
Steel Face Polished ₩ lb 15c
Solid Cast Steel " 25c
Spaths and Cradles.—Seymour Mfg. Co.'s dis 20 %
Springs.—Cleveland Spring Co.'s—
Carriage and Express dis 12½ %
Blue Seat Springs dis 15 %
Thimble Skeins.—Pump & Skein Co.'s dis 60 %
Vises.—Solid Box ₩ lb 16c
Wilson Mfg. Co.'s dis 15 %
Wheelbarrows.—Railroad & Garden new list net
Wrenches.—Coes' Genuine dis 25&5 %
Coes' Pattern dis 50 %
Wagons.—Whitewater Farm Wagons—
Thimble Skein No. 2, 3 in., $30; 3½, $32; 4 in. Axle No. 1½, $20; 1⅝, $22; 1¾, $90

St. Louis Metal Market.

(*Corrected Weekly by Messrs. R. Sellew & Co.*)

Tin Plate.

IC, 10x14, Charcoal	11 50 @ 12 00	IX, continuous, 20 in. x 280 ft.	
IX, 10x14, "	13 50 @ 14 00		
IC, 12x12, "	12 00 @ 12 50	IC, 10x14, best Coke	$11 00
IX, 12x12, "	14 50 @ 15 00	IC, 10x14, good Coke	9 50 @ 10 00
IC, 14x20, "	12 50 @ 13 00	IC, 10x20, Terne	10 50 @ 11 00
IX, 14x20, "	15 00 @ 15 50	IX, 14x20, "	13 50
IC, 20x28, "	22 00 @ 22 50	IC, 14x20, "	16 50
IX 20x28, "	27 00	IX, 14x20, "	19 00
IC, continuous 20 in. x 300 ft.		IC, 10x14, Coke Lead	9 00
		IC, 10x14, punch'd for Safes	10 50

Block Tin.

Large Pigs	Straits 28c	Bars	30c
Small "	English 22c		

Sheet Zinc.

Casks	₩ lb 10½c	Sheet	₩ lb 11c

Solder.

No. 1, Refined, in bars or plate	17c
No. 2, " " "	16c
Pig Lead	7¼c

Sheet Copper.—18 to 100 lbs., Sheets 30x60 30c
14 to 16 lbs., Sheets 30x60 30c
10 to 12 lbs., " and 30x72 33c
6 to 9 lbs., " 36c
Tinned, 14 and 16 oz. 14x48 31c
Planished, 14 and 16 oz. 14x48 38c
" No. 7, 8 and 9 40c
Copper Bottoms 43c

Sheet Iron.—

	Com'n.	Sm'th.	Char'l.	Juniata
No. 16 to 20	4½c	4½c	6½c	8c
No. 22 to 24	4½c	4½c	6½c	8c
No. 26	4½c	5 c	6½c	8½c
No. 27	4½c	5½c	7c	9½c

Galvanized Iron dis 25 %
Iron Rivets dis 25 %
Iron Wire dis 40 %
Coppered Market Wire dis 35 %
Copper Rivets and Burs dis 20 %
Russia Iron.—Nos. 9, 10, 11 and 12 ₩ lb 18c
No. 1 stained, ₩ lb 17c
Imitation Russia, ₩ lb 14c
Retinned Stamped Ware dis

TO ALL WHO USE STEAM-POWER!

We will put our Governor on any Engine, and guarantee it to prove itself superior to all others.

If, after a fair trial, it does not, we will take it off at our own expense.

Shive Governor Co

BETHLEHEM, PA.

ALSO,

SHIVE'S PATENT WATCHMAN'S CLOCK AND DETECTOR.

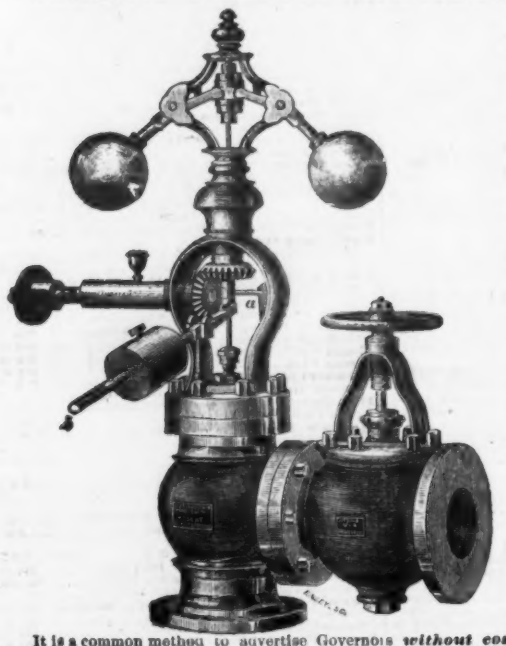
The Best and Cheapest Watcher of the Watchman made

PRICE ONLY $15.

Circulars sent free.

February 10, 1875. REDUCED PRICE LIST OF THE

JUDSON PATENT IMPROVED GOVERNORS.



☞ When Governors are ordered, be particular and say Governor with Stop Valve, or without Stop Valve; and either Black, Finished or Portable, as you may require, and with or without Lever Attachment.

For dimensions and other particulars send for Illustrated List.

Capacity of Valve or Diameter of Steam Pipe in Inches.	Price, Black.	Price, Bright Finish.	Price, Portable.	Price of Lever Attachment for altering speed.	Price of Stop Valve.
¾	18·00	20·00	17·00	..	..
⅞	20·00	22·00	19·00	..	..
1	24·00	27·00	22·00	2·00	5·25
1¼	29·00	32·00	27·00	2·25	6·62
1½	34·00	38·00	31·00	2·50	8·50
2	41·00	46·00	38·00	2·75	11·50
2¼	47·00	54·00	..	3·25	16·00
2½	50·00	57·00	47·00	3·50	17·00
2¾	55·00	62·00		3·75	19·00
3	62·00	70·00		4·25	22·00
3½	71·00	80·00		4·50	27·00
4	81·00	94·00		5·00	32·00
4½	91·00	108·00		5·50	37·00
5	102·00	114·00		6·00	43·00
5½	116·00	129·00		6·50	48·00
6	134·00	148·00		7·00	55·00
7	160·00	176·00		8·00	69·00
8	199·00	219·00		9·00	83·00
9	230·00	255·00		10·00	..

No Larger Portable made than 2½ in.

No Charge for Boxing & Cartage.

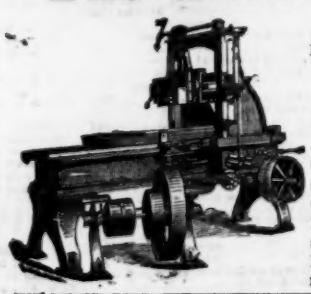
It is a common method to advertise Governors *without cost*, unless satisfactory to the customer, and then charge *High Prices* for doing what any good Governor will do. Various Governors inferior to the "Judson" are sold in this way, operating well enough for three months, to insure collection of the pay, but becoming useless after a year's wear—their construction lacking durability. The Judson Governor is guaranteed to be not only the best Regulator of Steam Engines, but also the most durable Governor made. Parties in buying other Governors should stipulate that their durability be guaranteed, and should also take care that they do not, for much inferior Governors, pay higher prices than those shown in the above list. We guarantee the Judson Governor will do all any other Governor can do, and in Accuracy and Durability—the main essentials—we guarantee it shall do more.

JUNIUS JUDSON & SON, Rochester, N. Y.

The Pratt & Whitney Co.,

Hartford, Conn.,

Have constantly on hand and making

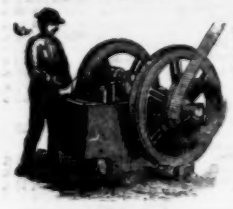


Drop Hammers

Of recently Improved Construction. Pony Trip Hammers, Blacksmiths' Sheaves, Broaching and Stamping Presses, Iron Shop Cranes, Machinists' Tools, Gun and Sewing Machine Machinery. Make to order Gray and Charcoal Iron Castings of all styles and sizes not exceeding 15 tons weight, (making patterns if desired). Furnish Clamp Pulleys of light patterns, cut gears in a superior manner, &c., &c.

BLAKE'S PATENT
STONE & ORE BREAKER.

New Pattern with Important Improvements & Abundant Strength



For reducing to fragments all kinds of hard and brittle substances, such as STONE for making the most perfect McADAM ROADS, and for making the best CONCRETE. It breaks stone at trifling cost for BALLASTING RAILROADS It is extensively in use in MINING operations, for crushing

IRON, COPPER, ZINC, SILVER, GOLD, and other ORES.

Also for crushing **Quartz, Flint, Emery, Corundum, Feldspar, Coal, Barytes, Manganese, Phosphate Rock, Plaster, Soapstone, &c.**

For Illustrated Circulars, and particulars, address,

BLAKE CRUSHER CO., New Haven, Conn.

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DRILLING MACHINES.

PORTABLE DRILLS. Driven by power in any direction, self-feed and convenient adjustment.

RADIAL DRILLS. Self-feed—large adjustable box table—separate base plate, every convenience.

VERTICAL DRILLS. Self-feeding—of new and improved designs.

MULTIPLE DRILLS. For boiler work, etc., 2 to 20 spindles, fed and returned by power or hand, together or separately.

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CORLISS STEAM ENGINE.

The Best in the World for Economy in Fuel and Cost of Running.

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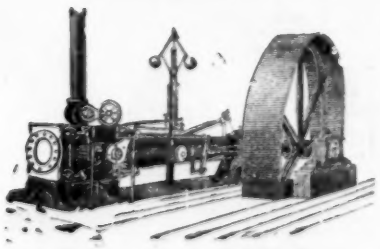

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Engineers, Machinists, Founders,

And BOILER MAKERS.

Stationary Engines, Shafting, Mill Gearing, Hoisting Machines, Improved Piston Packing and Machinery.

Special attention given to boring Ports and Cylinders.

A Written Guarantee given with our Pumps.

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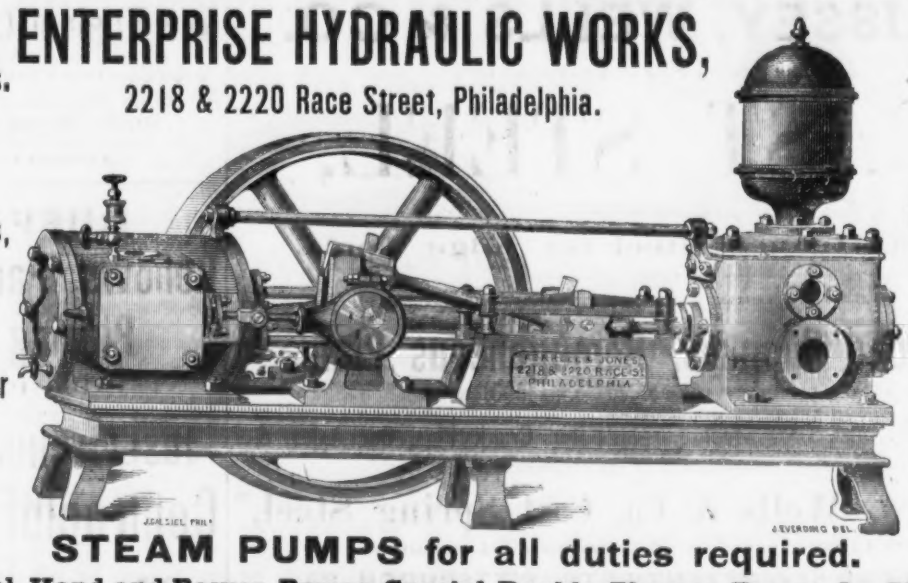
2218 & 2220 Race Street, Philadelphia.

Fan Blowers. Piston Blowers, "FOULDS" Patent Water Elevator.



Our Fly Wheel STEAM PUMP is admirable For Fire Purposes.

STEAM PUMPS for all duties required.

Centrifugal, Hand and Power Pumps, Special Double Plunger Pumps for Mining Purposes. Boiler Feed and Tank Pumps.

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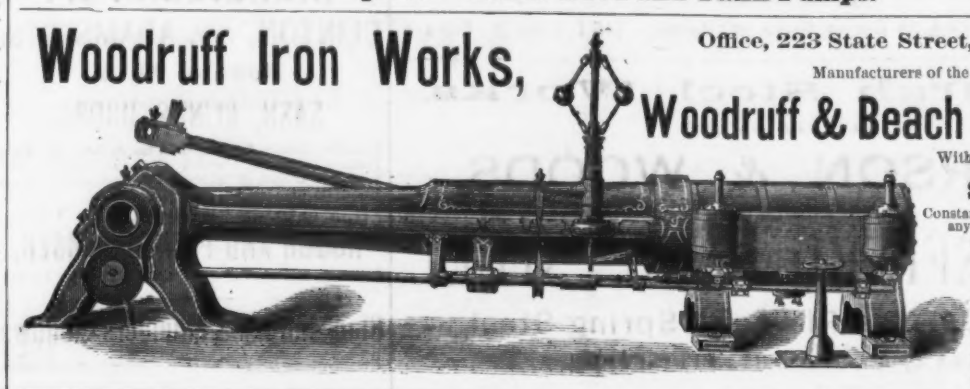
Office, 223 State Street, Hartford, Conn.



Manufacturers of the Celebrated

Woodruff & Beach Steam Engine,

With recent valuable improvements.

Steam Boilers

Constantly on hand and made to order any size or style. Special attention given to the manufacture of

MILL WORK

And all kinds of Machinery.

CASTINGS

Of any size or style. Direct all letters to **The Woodruff Iron Works, Hartford, Conn.**, as the Woodruff & Beach Iron Works and firm of Woodruff & Beach are both dissolved.

Knowles Patent Steam Pumps

MANUFACTURED BY THE

KNOWLES STEAM PUMP WORKS,

WARREN, MASS.

WAREHOUSES:

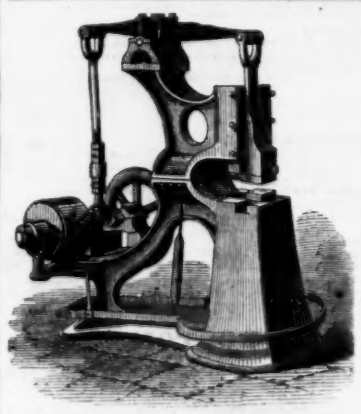
14 & 16 Federal Street, Boston, 92 & 94 Liberty Street, N. Y.

Cut above represents regular Boiler Feed Pump, No. 3 and 4. Showing New Patent Valve Motion, and Hand Power LEVER Attached and Detached.

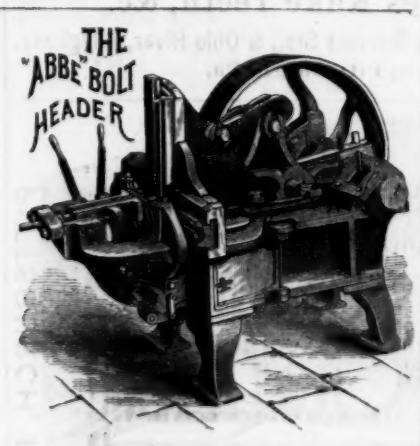
FIRE PUMPS, a specialty.

Mining Pumps (both Double Acting Plunger, and Piston Pattern,) which we guarantee to run absolutely noiseless on any lift from 100 to 600 ft., at a single lift, a specialty. Pumps for every possible duty. Prices as low as any, and our workmanship and material altogether the Best.

Every machine furnished under a complete guarantee.



THE PALMER POWER SPRING HAMMER.



Of these Machines we are building sizes to meet the requirements of all Manufacturers and Workers of Iron and Steel. In simplicity, durability, ease of operation, accuracy, and range of work, we guarantee them superior to any Machines of their kind produced in the world. For prices, references, and full descriptive circulars, address

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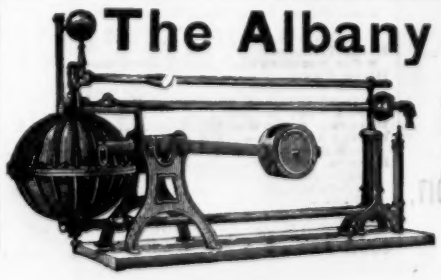
The Albany Steam Trap.



This Trap automatically drains the water of condensation from *Heating Coils*, and returns the same to the Boiler *whether* the Coils are *above or below* the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes. Apply to

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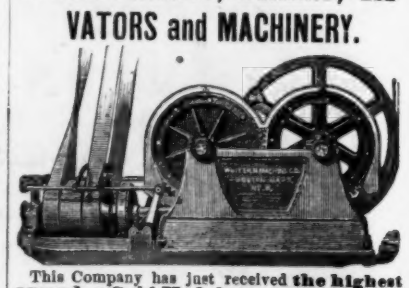
Manufacturers of

STEAM ENGINES, BOILERS, ELEVATORS and MACHINERY.



This Company has just received **the highest award, a Gold Medal, for Safety Elevators,** from the Massachusetts Charitable Mechanics Association.

CHARLES WHITTIER, Prest. JAMES STURGIS Treas.

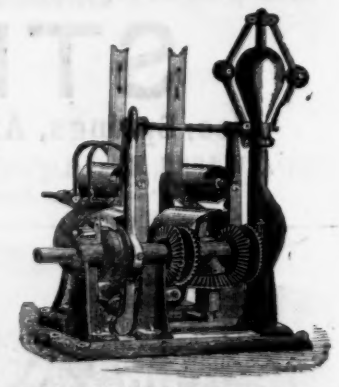
DIFFERENTIAL GOVERNOR.

The HARTFORD GOVERNOR CO.,

Sole makers of the

Weaver Differential Governor,

FOR WATER OR STEAM.



Powerful, positive, radically new. Introduced and working with complete success. Write us for circular, etc., at

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Patented Steam and Hydraulic, April 1, 1868.

EAGLE PACKING,

Of various sizes for **ENGINES and PUMPS,** manufactured by JAMES GLANDING & CO., No. 115 Queen St., Philadelphia. What the proprietors claim for the Eagle Packing: 1. Its general adaptation to all purposes for which packing is used. 2. Its durability. It will outlast any other article in use. 3. Its cheapness. It can be furnished to the consumer at a lower rate than any other packing

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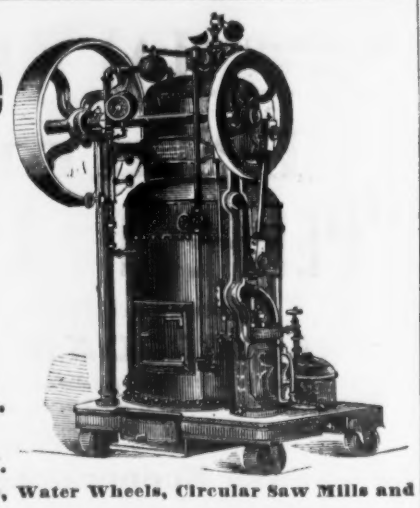
Drawings made to order. Repairing of all kinds promptly attended to. Blacksmithing executed in all its branches.

Machinery, &c.

THE

Shapley Engine



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COMPACT,
PRACTICAL,
DURABLE,
ECONOMICAL.

$200·00.

Cheaper than any Engine offered of the same capacity.

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Manufacturers of **Steam Engines, Boilers, Water Wheels, Circular Saw Mills and Mill Work generally.**

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POWER LOOMS,
SPOOLING, BEAMING, DYEING and Sizing Machines.
PATENT BOBBIN WINDING MACHINES
wind direct from hank or skein to shuttle bobbin.
SHAFTING
With Patent Adjustable self-oiling Bearings.
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Pulleys, from 4 inch to 10 feet in diameter.
Pulleys made in two parts, any size required.
SELF-ACTING WOOL-SCOURING MACHINES,
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Improved Power Hoisting Machines.
Machine and Foundry Work in all their branches.
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Send for list of Pulleys, &c.
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PORTABLE PIPE AND BOLT
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Cuts off and threads from ⅛ inch to 3 inch Pipes and Bars. Also taps Nuts and Centers work ready for Lathe. One man can thread 3 inch Pipe with ease with Dies furnished with machine. No Pipe splitting; no bevel inside or out. Requires no skilled labor.

A Full Set of Sockets and Lengths for Making Nipples Furnished with each Machine.

ANY SOLID DIE CAN BE USED IN THIS MACHINE.

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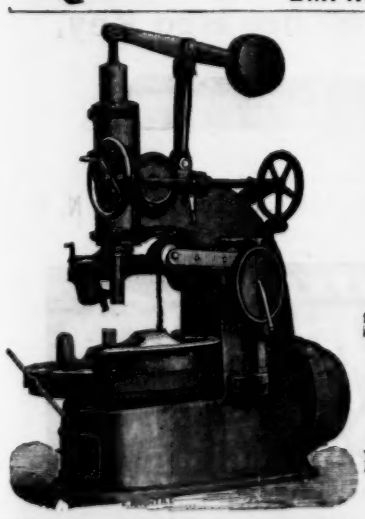

NEW-YORK STEAM ENGINE CO.
MACHINISTS' TOOLS
CHAS. A. CHEEVER Treas. No. 98 CHAMBERS St. NEW-YORK
GEO. Q. DOW. Secy.

We have the best and most complete assortment of

MACHINISTS' TOOLS,

in the country, comprising all those used in **Machine, Locomotive and**

R. R. REPAIR SHOPS.

We make a specialty of manufacturing

Gear Wheels of all Descriptions,

which are made absolutely perfect, with **Patent Gear Molding Machine.**

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STURTEVANT

Pressure Blowers, Fan Blowers and Exhaust Fans.

10,000 SOLD IN SIX YEARS.

SEND FOR ILLUSTRATED CATALOGUE.

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Machinery, &c.

COMBINATION.

Having purchased all of the Right, Title and Interest of the firm of DIBBLE & HINE, of New Haven Ct., in the

Hine Patent Bolt Cutter and Nut Tapping Machines,

and having combined the "Hine Patent and Chapin Improved Bolt Cutter," we now offer to the public the improved

HINE PATENT BOLT CUTTER, the best machine in the market.

Its superiority over all other machines is the ease and rapidity with which the Dies can be changed, and the quality and quantity it can produce. Any boy can, in one minute, change the Dies from one size to another. We build machines to cut from one-quarter inch to and including two inches. Hence we can furnish the Bolt Shop, Railroad Shop, Machine Shop, or any shop with the **cheapest** and **best** Bolt Cutter in the market.

Prices and any information given on receipt of letter, by addressing

THE CHAPIN MACHINE COMPANY,
Pine Meadow, Conn.

TIRE BLANK AND RIVET MACHINES, BOLT HEADERS, &c., constantly on hand and made to order.

Established 1848.

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RAILWAY SHOP EQUIPMENTS.

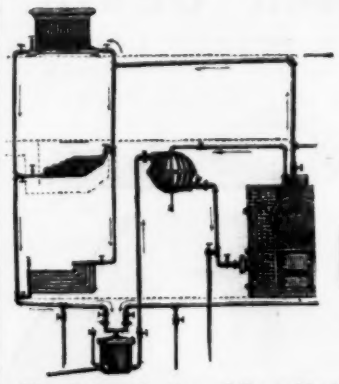
Our Steam Hammers, Lathes, Planers, Drills and Bolt Cutters
Are of Improved and Patented Construction.

Railway Turning and Transfer Tables,
SHAFTING & MILL GEARING, a specialty.

Pivot Bridges.

☞GIFFARD'S INJECTOR--IMPROVED, SELF-ADJUSTING.☜

AUTOMATIC STEAM TRAP WORKS.



C. A. PROUTY,
Inventor and Patentee.

Address,

Geo. W. Harrold,
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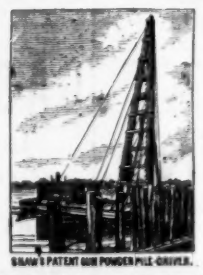
We call the attention of the public to a novelty in the shape of an Automatic Steam-Trap, which returns in a continuous stream, and at a high temperature, the water of condensation, together with steam from the radiating pipes, to the boiler, below the water line. Keeping the pipes free from water prevents strain and leakage, and increases their radiating power. With this arrangement the engineer will find his labor materially lessened, since the same supply of water is converted into steam, condensed and returned to the boiler repeatedly, so that the loss of water is consequently very small, and an expensive pump is not required. This trap, which has been in operation for two years, is simple in construction and practical in application; there are no levers, weights, cranks, diaphragms or pistons to get out of order. It is self-operating, thus requiring very little attention, and will work with one radiator or twenty, only one size being needed. It is perpetual in its motion, and therein unlike other traps whose actions are spasmodic.

THE AMERICAN DREDGING CO.

PATENT IMPROVED "GRAPPLE-DREDGE."



SHAW'S PATENT GUN POWDER PILE-DRIVER.

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BUILDERS OF STEAM DREDGING MACHINES,
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Steam Pumping Machinery

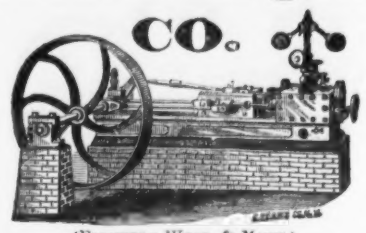
OF EVERY DESCRIPTION.

PHILADELPHIA HYDRAULIC WORKS, Cor, Evelina & Levant Sts., PHILA.

Send for Descriptive Price List.

Machinery, &c.

UTICA Steam Engine CO.



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STATIONARY & PORTABLE

STEAM ENGINES

The best and Most Complete Assortment in the Market.

These Engines have always maintained the very highest standard of excellence. We make the manufacture of Engines, Boilers and Saw Mills a specialty. We have the largest and most complete works in the country with machinery specially adapted to the work.

We keep constantly in process large numbers of Engines, which we furnish at the very lowest prices and on the shortest notice. We build Engines specially adapted to Mines, Saw Mills, Grist Mills, Tanneries, Cotton Gins, Threshers and all classes of manufacturing.

We are now building the celebrated Lane Circular Saw Mill, the best and most complete saw mill ever invented.

We make the manufacture of Saw Mill Outfits a special feature of our business, and can furnish complete on the shortest notice.

Our aim in all cases is to furnish the best machinery in the market, and work absolutely unequalled for design, economy and strength.

Send for Circular and Price List.

UTICA STEAM ENGINE CO.,
UTICA, N. Y.

LATHES, PLANERS,

and other

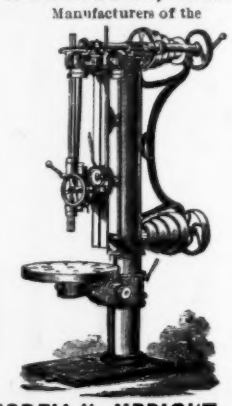
Machinists' Tools.

For Sale by

New Haven Mfg. Co.,

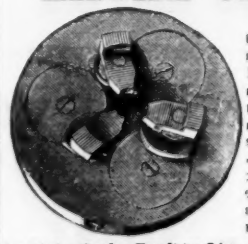
NEW HAVEN, CONN.

P. BLAISDELL & CO.,
WORCESTER, MASS,
Manufacturers of the



'BLAISDELL" UPRIGHT DRILLS.
And other First-Class Machinists' Tools.

JOHNSON'S PATENT UNIVERSAL
LATHE CHUCK.



We invite attention to the superior construction of this chuck. Its working parts are absolutely protected from dirt and chips. It is strong, compact and durable, and will hold the greatest variety of work, as the jaws are adjustable with range be full diameter of the chuck. For Price List address,

Lambertville Iron Works, Lambertville, N. J

LIST OF HARDWARE DEALERS.

Having compiled a complete list of the **Hardware Dealers** in the United States, expressly for addressing circulars, I am prepared to receive orders for addressing **ENVELOPES, CIRCULARS, &c.** The printed address is cut from the list and stamped upon the envelope or wrapper, thus enabling me to address a great number in a short space of time, and at rates far below the prices usually paid for this work. It answers all purposes, and can be done for one-third the expense of addressing by hand. My list contains names of over 4000 dealers, each State, city and town therein, being compiled separately. Wholesale Dealers and Manufacturing Co.'s, whose custom it is to send out circulars, price lists, &c., to the trade throughout the States cannot fail to find my list and style of addressing a great advantage to them, as it is a great saving of both time and expense. It has been tried by a large number in the trade, some of whose names appear at the bottom of this circular and to any of whom I would most respectfully refer. My rate for addressing is $2·50 per M. Envelopes, &c., sent to the address below, will receive prompt attention, and will be addressed and returned at once, or envelopes, &c., will be furnished at market prices. For further information, address,

CHAS. B. SMITH, No. 115 Broad St., N. Y.

REFERENCES.

Union Nut Co., 78 Beekman St.; L. Boardman & Son, 8 Chambers St., Millers Falls Co., 78 Beekman St., E. M. Boynton, 80 Beekman St., Yale Lock Mfg. Co., N. Y.

P. S.—Copies of my list will be forwarded to any address throughout the U. S. upon receipt of $2·00.

NEW YORK, February 8, 1875

TUBAL SMELTING WORKS,

760 South Broad Street, PHILADELPHIA.

PAUL S. REEVES,

MANUFACTURER OF

ANTI-FRICTION METALS

OF VARIOUS GRADES.

XXX Metal Nickel Hardening	50 cts. ℔ lb	D (These metals are alloys of lead, with a large percentage of tin, antimony and copper, according to price.	20 cts.
XX Metal Nickel Hardening	45 cts. ℔ lb	E	18 cts.
X Metal Copper Hardening	40 cts. ℔ lb	F	16 cts.
A " "	35 cts. ℔ lb	G (These metals are the ordinary low priced Babbitt alloys, used where there is not much wear on the machinery, and where economy is required.	14 cts.
B " " "	30 cts. ℔ lb	H	12 cts.
C "	25 cts. ℔ lb		

BRASS CASTINGS, 31 to 35c ℔ lb. | **INGOT BRASS,** 19 to 30c ℔ lb. | **BRASS TURNINGS AND OLD METALS WANTED.**

Plumb, Burdict & Barnard,

BUFFALO, N. Y.

MANUFACTURERS OF

BOLTS

COACH SCREWS.

SKEIN BOLTS,

CARRIAGE BOLTS,

TIRE, SLEIGH SHOE,

Machine and Blank Bolts.

FERNALD & SISE, N. Y. Agents, 100 Chambers St.

ESTABLISHED 1842.

WM. & HARVEY ROWLAND,

PHILADELPHIA,

P. O. Address: Frankford, Philad'a. } MANUFACTURERS OF ALL KINDS OF

Elliptic, Platform AND C Springs,

MADE EXCLUSIVELY FROM

SWEDISH STOCK, OIL-TEMPERED and WARRANTED.

Swedish Tire, Toe, Blister and Spring Steel.

CAST SPRING AND PLOW STEEL.
CAST SHOVEL, HOE AND MACHINERY STEEL.

BESSEMER TOE, SLEIGH AND TIRE STEEL.
BESSEMER SHOVEL AND PLOW STEEL.
BESSEMER MACHINERY AND CULTIVATOR STEEL.

RE-ROLLED NORWAY SHAPES.
NORWAY NAIL RODS ROLLED AND SLIT FROM SUPERIOR BRANDS.

SUCCESS

BEYOND COMPETITION.

Nellis' Patent Cotton Tie.

This TIE meet the approval of every Planter and Factor that has given it a trial. A single trial at the Press or Compress affirms its strength, merits and advantages over any in the market. We are prepared to supply the trade at market prices. Orders and Sample Orders respectfully solicited.

Nellis' Process for Tempering Steel,

Which we use in the manufacture of Moldboards, Walking and Riding Cultivator Shovel, Oval and Flat Reversible Points, Cultivator Teeth, Rolling Coulters, Cotton Sweeps, Scrapers, Bull Tongues, Pea Vine Cutters, Whiffletree Clips, Steel and Iron Harrow Teeth, &c.; in fact, everything in the Agricultural Steel lines, which we bevel, temper and finish to suit all kinds of soil. Implement makers and Farmers can govern themselves in making selections by the imprint thereon of our Trade Mark.

Also Manufacturers of Nellis Original Harpoon Horse Hay Fork, Nellis' Grapple and Pulleys and Hart's Post Auger. Your wants in our lines will receive prompt attention by addressing

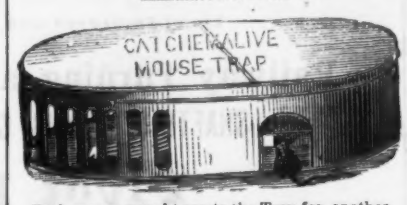
A. J. NELLIS & CO.,
Pittsburgh, Pa.

ESTABLISHED 1840.

R. E. DIETZ,

No. 54 & 56 Fulton, and
29 & 31 Cliff Street, New York,

Manufacturer of the



Each mouse caught resets the Trap for another.

TUBULAR

And Other

Patent Lanterns

BRASS AND IRON

Jack Chains.

D. K. MILLER LOCK CO.,
712 Cherry St., Philadelphia, Pa.
Security, Durability, Convenience.

IMPROVED SELF-LOCKING
Brass Pad Locks.

Made in the most substantial and compact manner, and are in every respect a superior article. We guarantee that no two locks are alike, unless specially ordered. Each lock furnished with two keys. Any number of locks or keys made to order. Adopted by the United States Government. Samples of No. 1 Lock sent to all parts free, on receipt of $1.75. **Liberal Discounts to the Trade.**

GAS FIXTURES.

Lamps, Bronzes.

Equal to any made, in great variety, all of our own manufacture.

BRADLEY & HUBBARD MFG. CO.,
SALESROOMS:
21 & 23 Barclay, cor. Church St.,
NEW YORK.

William N. Jennings,

FINE PRINTING and STATIONERY

No. 43 Franklin Street,

Bet. Broadway & Elm St., NEW YORK.

READ & DICKEY,

Cleveland, O.
BROKERS IN

IRON.

Pig, Bar, Band, Hoop, Plate, Sheet, Skelp, Nails, &c.

Established 1827. Oldest House in the Plumbago Trade.

46 Prizes since 1839 for our Black Lead Manufactures.

DIXON'S

Silver Medal Paris Exposition, 1867.

Plumbago "PERFECT LUBRICATOR,"

Being Finely Pulverized and absolutely Pure

AMERICAN GRAPHITE.

A Sure Preventive of, and Cure for, Hot Journals or Heated Bearings of any kind.

WILL SAVE WEAR, DELAYS, TIME AND MONEY.

It is not a compound or mixture, but Pure Graphite, of wonderful and unique properties, free from grit, a perfect conductor; not touched by acids, or changed by fire or frost.

Safe, Economical, Indestructible.

Known as the best Lubricator 900 years ago, but nobody has been heretofore prepared to furnish it in a perfectly pure state to the trade. *FIFTY CENTS PER POUND.*

The Joseph Dixon Crucible Company,

ORESTES CLEVELAND, President, Jersey City, N. J.

Works and Offices, 233, 235, 237, 239, 241 and 243 RAILROAD AVENUE; 250, 252, 254 and 256 WAYNE STREET.

Russell, Burdsall & Ward,

PORT CHESTER, N. Y.

Manufacturers of

Carriage, Tire, Plow, Stove.

AND OTHER

BOLTS.

Carriage Bolts made from Best Square Iron, a Specialty.

The "Domestic" Blind Adjusters.

Hold the Blinds in any Position,

And require no Hooks or Catches on the House.

Patented June 11, 1872. BROAD PLATE NARROW PLATE and August 25, 1874.

In SUMMER they will keep the Blinds bowed, or in any position desirable for shading a room, and in WINTER they enable them to be opened or closed *without reaching out of the window*, by simply raising the sash a few inches.

INVALUABLE FOR BAY WINDOWS.

Gray's Ratchet Bed Key.

Manufactured by
VAN WAGONER & WILLIAMS, 82 Beekman St., N. Y.

GEM DOOR & GATE SPRING
AN EASILY ADJUSTED POWERFUL & EFFECTIVE SPRING.
MANUFACTURED BY
VAN WAGONER & WILLIAMS
82 BEEKMAN ST N.Y.

DERBY SILVER CO., Derby, Conn.,

Manufacture the most reliable

SILVER PLATED SPOONS & FORKS.

They are plated by weight, and not by time or guess, containing 20 per cent. more silver than the usual standard, on a base of Nickel Silver, and finished by hand. Each article is guaranteed by the trade mark and warranted to give full satisfaction. We ask of the trade a fair and impartial test, assuring them that the high standard already attained, shall be maintained. Send for Catalogue and Price.

HENRY C. MEYER & CO.,

Manufacturers of

BRASS WORK

For Water, Gas and Steam.

Schofield's Pat. Gauge Cock.

Hall's Pat. Lock

Cock for Meters.

Importers and Dealers in

PLUMBERS' MATERIALS.

48 Cliff Street, New York.

Illustrated Catalogues expressed to the trade on application, where this advertisement is referred to.